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A WILDLIFE HABITAT PROTECTION, MITIGATION AND ENHANCEMENT PLAN FOR EIGHT FEDERAL HYDROELECTRIC FACILITIES IN THE WILLAMETTE RIVER BASIN

Final Report

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ABSTRACT

The development and operation of eight federal hydroelectric projects in the Willamette River Basin impacted 30,776 acres of prime wildlife habitat. This study proposes mitigative measures for the losses to wildlife and wildlife habitat resulting from these projects, under the direction of the Columbia River Basin (CRB) Fish and Wildlife Program. The CRB Fish and Wildlife Program was adopted in 1982 by the Northwest Power Planning Council, pursuant to the Northwest Power Planning Act of 1980. The proposed mitigation plan is based on the findings of loss assessments completed in 1985, that used a modified Habitat Evaluation Procedure (HEP) to assess the extent of impact to wildlife and wildlife habitat, with 24 evaluation species. The vegetative structure of the impacted habitat was broken down into three components: big game winter range, riparian habitat and old-growth forest. The mitigation plan proposes implementation of the following, over a period of 20 years: 1) purchase of cut-over timber lands to mitigate, in the long-term, for big game winter range, and portions of the riparian habitat and old-growth forest (approximately 20,000 acres) 2) purchase approximately 4,400 acres of riparian habitat along the Willamette River Greenway 3) three options to mitigate for the outstanding old-growth forest losses. Monitoring would be required in the early stages of the 100-year plan. The timber lands would be actively managed for elk and timber revenue could provide O&M costs over the long-term.

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EXECUTIVE SUMMARY

The following report provides a general plan to mitigate for significant losses to wildlife and wildlife habitat in the Willamette River Basin. These losses resulted from the construction of eight federal, mutli-purpose reservoir projects. Only the impacts attributable to hydroelectric development, maintenance and operation, as discussed in Appendix B, will be mitigated for under this plan. The basis for determining the exact proportion of hydro-allocation responsibility has not yet been agreed upon.

The report bases its recommendations for mitigation, using a habitat-based approach, on losses identified during an earlier phase of this planning process. Utilizing the structural component concept explained in Section III.D (Pg. 20), the habitat losses were grouped into three major categories: big game winter range, riparian habitat (i.e., vegetation along streams and rivers), and old-growth forest (i.e., timber stands approximately 200 years old). This approach was taken because 1) habitat structure is extremely important to wildlife 2) each of the habitat categories is important to a large number of wildlife species 3) three overall categories are easier to understand and work with, than numerous, smaller, isolated vegetation types, and 4) the winter range, riparian and old-growth categories all represent threatened habitats in western Oregon.

It was determined that, of the 20,123 acres of prime habitat permanently lost as a result of the eight projects, 49 percent was general purpose big game winter range, 25 percent riparian habitat and 26 percent old-growth forest. Essentially, this division of the 20,123 acres represents "critical" big game winter range dissected into its component parts. The most important reason for this approach is that, although riparian habitat and old-growth forest are necessary to the existence of critical elk winter range, they also have high intrinsic value to many other wildlife species: Values unrelated to winter range.

The mitigation approach taken was, to first identify representative "key" mitigation sites. These were selected primarily for their potential as future big game winter range. These sites are cut-over private timber lands which have the capacity to provide winter range for all but the harshest winters. The quality of the low-land critical winter range that was lost, can never be replaced. The purchase of approximately 20,000 acres of these cut-over timber lands would provide the total structural replacement goal (49 percent) for elk winter range. These lands would also provide mitigation for three percent of the riparian goal and six percent of the old-growth forest goal.

Timber on the representative key mitigation sites is only around 10 to 20 years old, but the old-growth component is credited as "functional" at 90 years of age. This does not represent true old-growth, but allows us to credit mitigation during the 100-year time-frame of the mitigation plan, according to a weighting system in Table 5 (pg. 52). For example, a mitigation site with a timber stand 20-years-old, will be credited as functional old-growth for30 years because it will be 90+ years old for that proportion of the 100-year plan. This "trade-off" is recommended because of the dedication, under this plan, of a certain segment of these mitigation lands to old-growth forest; and the long-term benefit of public ownership.

At the point where all potential mitigation value has been credited on the key mitigation sites (i.e., 20,000 acres), there is still an outstanding debt: 22 percent (i.e., 4,400 acres) of riparian habitat, and 20 percent (i.e., 3,900 acres) of true old-growth forest. The consensus of the Mitigation Team was to seek to fulfill the riparian habitat goal through purchase of private land within the boundaries of the projected Willamette River Greenway Plan. Numerous opportunities for acquiring prime riparian habitat have been identified (Appendix H). There is no clear resolution as to how to achieve mitigation for old-growth forest beyond that on the key mitigation sites. Subsequently, three options are provided: 1) purchase, if possible, 3,900 acres of true old-growth forest 2) purchase 5,934 acres of 40-year-old second-growth, and 3) provide $20 million to maximize the mitigation opportunities for old-arowth according to a specific heirarchv of criteria (pg. 42). The basic mitigation approach-is summarized as follows:

Purchase:	1) 20,000 'acres of private cut-over timber lands (for a cost of approximately $16 million)		
	and		
	2) 4,400 acres of private land along the Willamette River Greenway (for a cost of approximately $6,600,000)		
	Plus		**For total purchase and management costs of:**
01 d-growth Option:	1) Purchase 3,900 acres of old-growth (for approximately $80 million)	=	$106,331,336
	or		
	2) Purchase 5,934 acres 40-year-old timber (for approximately $47 million)	=	$ 73,343,104
	or		
	3) Provide $20 million to' maximize opportunities	=	$ 46,307,500

The scope of this mitigation plan encompasses the following overall goals:

a. Protect sufficient habitat through purchase, easement and enhancement to compensate for the value of the habitat directly impacted; and regain concomitant lost management opportunities:

b. Select those mitigation opportunities which would, first of all, address the specific losses sustained (i.e., replacement of winter range, riparian and old-growth forest components), while at the same time benefitting the largest number of species possible, and taking into consideration current habitat and wildlife management needs.

C. Provide sufficient flexibility for achieving mitigation within the Willamette Basin, while allowing for the large number'of "unknowns" (e.g., availability of preferred mitigation sites, schedule of funding, fluctuations in cost of old-growth forest lands).

As discussed in Section V (pg. 63), relative to other hydro-sites within the Columbia River Basin, we are faced with a consideration that is unique to the Willamette Basin: the high cost qf doing business in some of the most productive coniferous forest lands in the world. To adequately mitigate for the identified losses, depending on which option of the preferred alternative is considered, would cost between $46 million and $106 million over a period of 20 years (pg. 49). Mitigation, even at these levels, does not provide equal replacement of lost habitat value. The Mitigation Team accepts the inability to fully rectify past oversights with the resources at hand (i.e., Bonneville funds and available habitat).

The recommendations in this mitigation plan represent a biological statement: this is what was lost; this is what it would take under today's constraints, to mitigate for a significant portion of that loss. This fulfills the contractual obligation of Oregon Department of Fish and Wildlife with the Bonneville Power Administration under the Columbia River Basin Fish and Wildlife Program, to develop a wildlife mitigation plan in concert with other wildlife and land management agencies, using the most current scientific information available. We have provided strong biological justification for the mitigation recommendations, based on the magnitude of the habitat loss.

The biological scope of this mitigation plan has been defined, but several fundamental issues have not yet been addressed. These issues include, what level of funding the Northwest Power Planning Council will approve for the Willamette; what the percent,of hydro-allocation mitigation responsibility will be; whether the general public feels the mitigation level for their lost resources is too little or too much, and, to what degree the state and federal policy-makers feel the identified losses should be mitigated, relative to the opportunities available. The feasibility of'mitigation needs to be defined in terms of 'fair" compensation for Oregon, relative to the proportion of Bonneville funds dedicated to wildlife in the Columbia River Basin; and, in terms of the mitigation opportunities, what is the best expenditure of those funds that would be compatible with state and federal policy.

Between 25 to 40 years ago, construction of the Willamette projects removed a significant land base from the State of Oregon. Also lost was the opportunity to manage .the concomitant wildlife resources. Regardless of the causes of neglect in dealing with these losses, now that we have a blueprint for wildlife mitigation in the Willamette Basin, it should no longer be delayed..-

Michael C. Weland
Assistant Director
Habitat Conservation Division

I, . INTRODUCTION

This report presents a plan to protect, mitigate and enhance wildlife resources affected by the development and operation of federal hydroelectric facilities in the Willamette River Basin of Oregon. The eight projects constructed and operated by the U.S. Army Corps of Engineers (USACE) include: Lookout Point, Dexter and Hills Creek dams on the Middle Fork of the Willamette River; Cougar Dam on the South Fork of the McKenzie River; Green Peter and Foster dams on the Middle Santiam and Detroit and Big Cliff dams on the North Santiam (Figure 1). The Willamette Basin drainage system is a major tributary of the Columbia River. These federal projects come under the auspices of the Columbia River Basin (CRB) Fish and Wildlife Program adopted by the Northwest Power Planning Council (NPPC) in 1982, pursuant to Section 4(h) of the Northwest Power Planning and Conservation Act of 1980 (Regional Power Act).

Development of this plan was consistent with Section 1000 of the CRB Fish and Wildlife Program and was funded by the Bonneville Power Administration (BPA). This plan completes the third phase of a four phase process to mitigate for hydro-related impacts to wildlife at the identified projects, and provides the methodology for the implementation, or final, phase. This plan is based on the wildlife habitat loss assessments completed in 1985 for all of the projects and is consistent in proposing habitat-based mitigation as opposed to population-based mitigation. An accounting system using "target" species to evaluate habitat quality was used to assess both habitat losses and potential gains. The broad objectives of this plan were to: 1) develop wildlife protection, mitigation, and enhancement goals for the target species and, 2) recommend actions for the protection, mitigation and enhancement of the target wildlife species.

Development of a large-scale mitigation plan, 25-40 years after initial impacts have occurred, presents many difficulties. In all aspects of the mitigation planning process, we have attempted to maintain a balanced biological perspective. For example, we have credited natural habitat recovery that has occurred since dam construction, as well as benefits to wildlife that have resulted from project development. At the same time, the quantity and quality of the habitat lost no longer exists in the basin, so an innovative mitigation approach was necessary.

This plan was developed on a basin-wide approach because, in addition to the ecological similarity of the project areas, it was believed this approach would provide greater mitigation options, and be both more cost-effective and expedient.

Although not fully taken advantage of, participation by all interested parties was encouraged. The final mitigation team did represent all public agencies with wildlife resource management responsibilities within the Willamette Basin (Appendix A). This report represents the best effort to develop a viable wildlife mitigation plan for the Federal Power System in the Willamette Basin, taking into consideration such diverse factors as lost management opportunities, present opportunities, resource availability, present management needs, biological needs, high timber-growing capacities and value, as well as changing public values.

Willamette River Basin
Federal Hydroelectric Projects

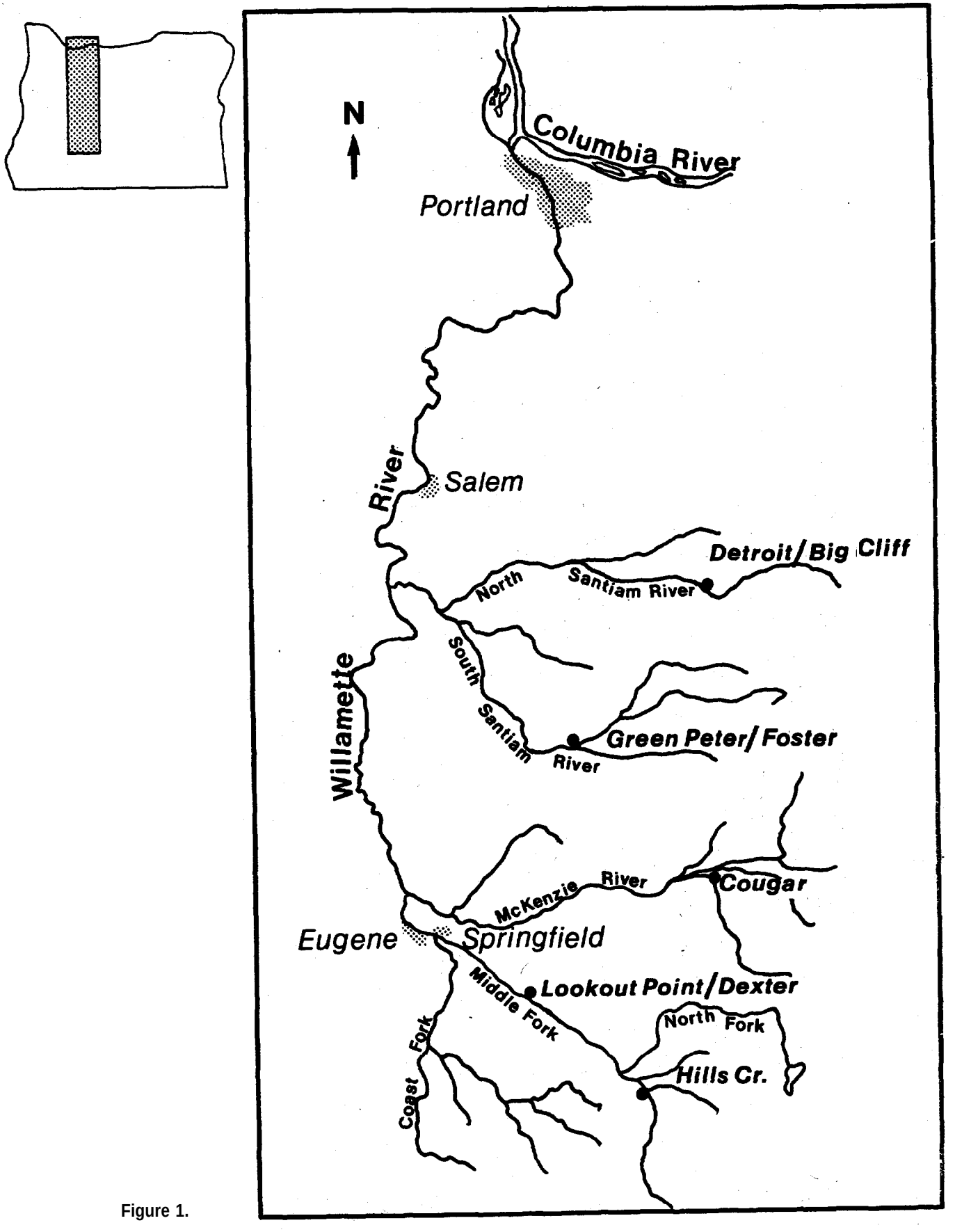


Figure 1.

II. DESCRIPTION OF PLANNING AREA AND PROJECT IMPACTS

II.A Planning Area

II.A.1 Project descriptions

The Willamette projects are located in three major drainages of the Willamette River Basin (Figure 1). Cougar Dam is located at river mile 4.4 of the South Fork McKenzie River. Situated on the Middle Fork Willamette River are Dexter (river mile 18), Lookout Point (river mile 21.3), and Hills Creek (river mile 47.8) dams. Foster Dam is located at river mile 38.5 of the South Santiam River, and upstream from it is Green Peter Dam at river mile 5.5 of the Middle Santiam River. Located on the North Santiam River are Big Cliff ('river mile 45.5) and Detroit (river mile 48.5) dams.

Cougar, Hills Creek, Dexter, and Lookout Point reservoirs are located within Lane County. Foster and Green Peter reservoirs are within Linn County, and Detroit and Big Cliff reservoirs are situated along the boundary between Linn and Marion counties.

Cougar, Hills Creek, Lookout Point, Green Peter, and Detroit projects are multiple purpose facilities. Dexter, Foster, and Big Cliff projects are reregulating reservoirs. The Willamette projects have the combined capability to produce 408,000 kilowatts of power.

Construction on the eight Willamette projects was initiated between 1947 and 1961. Detroit and Big Cliff were the first projects completed (1954); Green Peter and Foster were the most recent facilities to become operational (1969).

With the exception of Dexter, Foster and Green Peter reservoirs, the Willamette projects are located within the boundaries of the Willamette National Forest of the U.S. 'Forest Service (USFS). The upper portion of Green Peter Reservoir is within the Salem District of the Bureau of Land Management (BLM); the remainder of Green Peter, most of Big Cliff, and all of Foster and Dexter reservoirs are surrounded by privately owned lands.

II.A.2 Loss assessments

Consistent with Measure 1004(b)(2) of the CRB Fish and Wildlife Program, loss assessments were completed in 1985 for all of the projects. The "affected areas" referred to in the loss assessments were most intensively studied and included the areas directly affected by project construction and operation. The affected areas encompassed the reservoirs, project facilities, staging areas, and relocated roads. Areas not directly affected by the projects, but within the range of species using the project areas, were considered when determining qualitative impacts.

The loss assessments were limited in scope in that they did not address secondary impacts such as downstream water fluctuations from project operations, powerline development, and potential positive or negative

-impacts.resulting from increased opportunities for irrigation. These secondary impacts in the Willamette Basin are probably less significant than secondary impacts elsewhere in the Columbia River Basin.

II.A.3 Environment of project areas

The Willamette projects are located primarily in the Western Hemlock Zone described by Franklin'and Dyrness (1973). The reservoir sites were generally characterized by stands of Douglas-fir (Pseudotsuga manziesii), western red cedar (Thuja plicata), and western hemlock (Tsuga heterophylla). Scattered standsofeaf maple (Acer macrophyllum), and black cottonwood (Populus trichocarpa) occurred along the rivers or lower slopes. Common understory vegetation included red alder (Alnus rubra), vine maple (Acer circinatum), Pacific dogwood (Cornus nuttallii), willow (Salix spp.), Pacific rhododendron (Rhododendron macrophyllum), Oregon grape (Berberis spp.), salal (Gaultheria shallon), blackberry (Rubus spp.), and various ferns, grasses and forbs. The Dexter and Foster reservoir sites were characterized by the previously mentioned deciduous and understory vegetation cover types interspersed with- agricultural lands. More detailed descriptions of vegetation cover types are provided in the loss assessment reports (Bedrossian et al. 1985a,b,c,d; Noyes et al. 1985; Potter et al. 1985).

Black-tailed deer and Roosevelt elk (Appendix F) inhabited most of the project sites prior to project construction. Black bear, cougar, bobcat, beaver, river otter, muskrat, mink, marten, raccoon, gray fox, brush rabbit, and both the spotted and striped skunk also inhabited most of the reservoir areas, as did blue and ruffed grouse, mountain quail, ring-necked pheasant, band-tailed pigeons, hooded and common mergansers, mallards, and wood ducks, (Appendix F). Preconstruction information on nongame species was not documented. In addition to those species documented to be present prior to construction, the affected areas potentially supported many more wildlife species (Appendix F).

As identified in the Willamette Basin Mitigation Status Reviews completed in 1984 under Measure 1004(b)(l) of the Columbia River Basin Fish and Wildlife Program, no wildlife mitigation measures were implemented to directly offset impacts resulting from project construction or operation.

II.A.4 Scope of plan

The decision to develop a comprehensive plan to mitigate for impacts at all projects simultaneously was initiated by the limited wildlife enhancement opportunities close to the reservoirs, the homogeneity of the impacted and existing environment around the reservoirs, and the fact that all projects are owned and operated by the U.S. Army Corps of Engineers.

Priority was given to mitigation opportunities either on-site or in the immediate vicinity of the affected habitat. To avoid planning limitations, the entire Willamette Basin was considered as within the scope of providing mitigation alternatives. This was an important decision, because the quality of habitat that was lost no longer exists in

proximity to the project areas. Using the entire Willamette Basin provided the mitigation team with the flexibility needed to satisfy the mitigation goals.

II.B Project Impacts

II.B.1 Changes resulting from the projects

The Willamette projects inundated, extensively altered, or affected 30,776 [1] acres of land and river in the McKenzie, Middle Fork Willamette, and Santiam river drainages. Approximately 17,800 acres, 60 miles of river, and an undetermined number of miles of tributary streams were inundated; Surrounding land was altered by relocated roads, project facilities, and construction activities. The quantitative impacts considered in the loss assessment reports were limited to the areas directly affected by the Willamette projects.

Vegetation cover types impacted by the Willamette projects are shown in (Appendix C, Table 1). The largest single loss of wildlife habitat incurred by the Willamette projects was 5,184 acres of old-growth conifer forest. Other losses of wildlife habitat included pole-sized conifer forest, sawtimber, shrubland, grass-forb, conifer-hardwood forest, red alder stands, deciduous hardwoods and oak Savannah. vegetation cover types, as well as riparian hardwoods and shrubs,,herbaceous wetlands, agricultural lands, sand, gravel, and cobble, and river channels.

Cover types which increased significantly within the Willamette projects affected areas included the reservoirs, and disturbed, bare or rocky areas. Ponds, rocky cliffs and talus, coniferous wetlands, and residential, urban, industrial categories also increased slightly (Appendix C, Table 1).

Extreme water level fluctuations at most of the Willamette projects have precluded revegetation of the reservoir shorelines. This has resulted in a lack of escape cover and nesting, feeding, and resting habitat adjacent to the reservoirs. The reservoir shorelines are moderately to very steep, which limits use by wildlife. Wildlife habitat remaining within the affected areas above full pool level is often in narrow strips, or in small, isolated pockets. In addition to the loss of wildlife habitat, road use and recreational disturbance have degraded suitability of the habitat remaining within the affected areas.

In most cases, it was not practical or possible to estimate the number of animals lost or gained as a result of the Willamette projects because site-specific wildlife population estimates prior to construction were not available: Attempts to estimate the number of animals lost or gained at the Willamette projects is further complicated by the considerable change in conditions for wildlife in the Willamette Basin caused by timber harvesting and increased human use.

[1] Correction to summary report (Noyes and Potter, 1986).

II.B.2 Significance of losses

Construction and operation of the Willamette projects resulted in significant seasonai or year-round habitat loss for Roosevelt elk, black-tailed deer, black bear, cougar, beaver, river otter, mink, red fox, ruffed grouse, California quail, ring-necked pheasant; band-tailed pigeon, western gray squirrel, harlequin 'duck, wood duck, northern spotted owl, pileated woodpecker, American dipper, yellow warbler, and many other wildlife species. Important winter range for deer and elk, critical for survival during severe winter conditions, was located along the preconstruction river bottomlands. In addition, the Willamette projects blocked migration routes, hindered dispersal, and inhibited wildlife movement in the affected river drainages. Among the types of wildlife habitat lost as a result of the Willamette projects were old-growth conifer forest and riparian habitat, both of which are extremely important to wildlife in western Oregon.

II.B.3 Project Benefits to Wildlife

Construction of the eight federal projects in the Willamette Basin did not eliminate all habitat for fish and wildlife. It did, however, alter it dramatically in a short period of time from a riverine to an artificial lacustrine system. As with all major disruptions in habitat, some species benefit while others may no longer be able to survive. The Willamette Basin Loss Assessments measured both the positive and negative impacts this change in habitat structure had on wildlife species.

In the 25-40 years since construction of the dams, some natural habitat recovery has occurred on the 30,776 acres that were directly impacted or extensively altered. This has been credited. Measurements based on the loss assessments indicate 20,123 acres of habitat have been permanently altered. These acres are the focus of this mitigation plan (Appendix C, Table 1). With the exception of bald eagle, osprey and waterfowl, all of the evaluation species used to assess habitat value in the loss assessments, sustained a net loss in habitat values, as measured in Habitat Unit (HU's) (see Section IIIA, p.9).

Bald eagle gained 5,693 habitat units (HU's) and osprey gained 6,169 HU's (Noyes and Potter, 1986). Although the loss of perching and nesting sites, as well as pre-construction foraging opportunities (e.g., fall-winter salmon runs and riparian species prey base) were taken into consideration for eagles, the increased foraging opportunities provided by several thousand acres of reservoir surface outweighed the negative impacts in the view of the interagency mitigation team. The value of the reservoirs to bald eagles has not been systematically measured and could be seasonally limited by lack of perching sites, human disturbance and distance to suitable nesting sites.

The osprey probably benefited most from the construction of the reservoirs. Prior to the 1940's, the osprey was apparently common in the Willamette Basin, but lack of protection,, specifically in, populated areas, led to reduced populations of this raptor (Gabrielson and Jewett, 1940). Recent studies indicate an increase in nesting ospreys at the

Lane County reservoirs of Hills Creek and Cougar dams (Henny et al. 1978). Interactions between bald eagles and osprey may account for a recently-reported decrease in the latter species at Lookout Point and Dexter reservoirs (Pers. comm., D. Wheeler, 23 March 1987, ODFW, Springfield, OR).

As indicated in the Willamette Basin Mitigation Status Reviews (Bedrossian et al. 1984), no wildlife mitigation measures were taken at any of the eight projects to offset the impacts to wildlife resulting from construction and operation of the dams. Water level fluctuations in the reservoirs have prevented establishment of shoreline vegetation which provides hiding and nesting cover and brood rearing habitat for waterfowl as well as tree and shrub cover for non-game species and aquatic vegetation for ducks. During the drawdown 'period, the exposed mudflats provide some habitat value to shorebirds, but the distance to cover increases vulnerability to predation for many other wildlife species.

Experimental efforts to revegetate drawdown zones at reservoirs in the Cascades have been undertaken since 1971 by USACE, USFS, the Oregon Department of Fish and Wildlife (ODFW) and the Soil Conservation Service (SCS), Plant Material Center in Corvallis. Most of the testing has taken place at Blue River Reservoir, located within five miles of Cougar Reservoir on the south fork of the McKenzie River. Some seeding and planting attempts have also been made at Green Peter, Hills Creek and 'Lookout Point reservoirs. Seeding has not proven as effective as vegetative plantings (Pers. comm., S. Swanson, retired, SCS Plant Material Center, 23 March 1987, Corvallis, OR,). Vegetative plantings of bald cypress (Taxodium distichum) slough sedge (Carex obnuta), and Columbia sedge (Carex aperta), have shown a remarkable ability to withstand deep summer flooding, usually of three-months duration, at Blue River Reservoir, on undisturbed sites (letter summarizing -planting successes in western Oregon by S. Swanson, SCS Plant Material Center, 30 January 1974, Corvallis, OR, in ODFW files).

Vegetation of the drawdown zones with these and other suitable plant species could provide for soil stabilization, aesthetic values, increased aquatic nutrients, fish habitat 'and some foraging, nesting and perching opportunities for terrestrial wildlife. The value to big game has not yet been determined and would depend on location, palatability and quality of forage, but has the potential to provide a high quality, accessible winter forage. More research is needed to determine the overall value of planting drawdown zones, relative to plant survival, appropriate plant species, and habitat value. For example, at Green Peter Reservoir, full pool is maintained for approximately six months, or twice as long as at Blue River Reservoir. This longer submergence reduces the depth at which plants can survive (letter summarizing Green Peter drawciown vegetation, by S. Swanson, SCS Plant Materials Center, 24 December 1975, in ODFW files).

At several of the projects, the mudflats are used by recreationists in off-road vehicles (ORV's), thereby disturbing wildlife and destroying vegetation. Because of its proximity to big game habitat, the School Creek Cove drawdown area at Lookout Point was planted with bald cypress,

sedges and willows in about 1983 by the Forest Service. By the fall of 1986, these plantings had been severely damaged by ORV use (Pers. obs., 11 September 1986). Although a new Management Agreement between the Lowell Ranger District and USACE restricts ORV use in this area, public access has been and continues to be extremely difficult to control in the drawdown zones (Pers. comm., D. Lampster, USACE, Lookout Point Reservoir, 2 April 1987).

Wood duck nest boxes were placed on project lands around a few of the projects because of the lack of suitable older trees with natural cavities. Use of the boxes is not monitored.

Migrating waterfowl obtain some benefit from the reservoirs as resting areas. Resident fish provide a prey base for mergansers particularly at Dexter Reservoir. The high elevations, heavy surrounding forest cover, lack of shallow water areas with aquatic vegetation, distance from suitable food sources, and steep, unvegetated shorelines limit waterfowl use on most of the reservoirs.

III. METHODS AND GOALS

III.A Summary of Loss Assessment Methodology

Preconstruction, postconstruction, and recent vegetation cover types of the reservoir areas were mapped based on aerial photographs obtained from USACE in Portland, and the University of Oregon map library. Most photographs were black and white, but some recent photographs were color infrared. Scales varied from 1:4,800 to 1:48,000. Base maps, derived from USGS quadrangle maps, were enlarged to 1:24,000 and screened on mylar film. The mapped areas extended 1/4 mile from the full pool reservoir shorelines. Vegetation cover types were based on categories described by Hall et al. (1985), and are described in the loss assessment reports and in a summary report (Noyes and Potter, 1986).

Acres of cover types potentially used within the affected areas were totaled to determine the acres of habitat available to each target species at preconstruction, postconstruction, and recent time periods. Tables summarizing the cover types and acreages available to each target species were compiled. Habitat rating criteria worksheets providing information on habitat- requirements were prepared for each target species and are available from ODFW. The worksheets provided a standard from which ratings were based.

The method used to aid in evaluating the loss or gain of wildlife habitat as a result of'the Willamette projects was based on the Habitat Evaluation Procedure developed by the U.S. Fish and Wildlife Service (USFWS) (1976, 1980), Ecological Planning and Evaluation Procedures developed by the Joint Federal-State-Private Conservation Organization Committee (1974), and discussions with various USFWS, USACE, and ODFW personnel. This procedure utilized an interagency team of biologists (Appendix A, Table 1) that selected evaluation or "target" species and subsequently evaluated habitat conditions based on the selected species habitat criteria.

Wildlife species potentially occurring in the project areas (Appendix F) were identified based on a list of wildlife in the Willamette National Forest (USFS, undated), BLM Unit Resource Analysis (BLM 1979), and on the Oregon Nongame Wildlife Management Plan review draft (Marshall, 1984). Evaluation species are generally selected because. they are either of special significance in the study area, or they provide a broad ecological perspective. Target species selection for the loss assessments took into consideration such factors as threatened or endangered status, priority according to state or federal programs, recreational or economic importance, or degree of impact resulting from the project..

Twenty-four wildlife species or species groups were selected as target species for the loss assessments, but only black-tailed deer, beaver, ruffed grouse, bald eagle and osprey were used as target species at all eight Willamette projects (Appendix C, Table 2). Some habitat variation exists among the various projects, as would be expected considering the differences in elevation and the involvement of three major drainages. This warranted the use of specific species to pick up special habitat

characteristics. For example, Lookout Point and Dexter were the only projects to have a significant oak habitat component, which was evaluated by using the western gray squirrel. The band-tailed pigeon was used to evaluate the unique association of coniferous forest and mineral springs inundated at Green Peter. During the evolution of the mitigation planning process in the Willamette Basin, it was recognized that the decision to plan basin-wide would result in some reduction in detail regarding true losses. However, it was felt the gains in mitigation opportunities over the larger area would compensate for this loss.

Once acres of habitat available to each evaluation species were agreed upon by the team of biologists for preconstruction, postconstruction and recent conditions at each project, the quality of habitat was rated. Ratings were derived from visits to the project sites, aerial photographs, vegetation maps, habitat' requirements of the target species, and biologists' expertise and experience. The quality of the habitat at each of the three time periods was rated on a scale of 1 to 10 (1=low; 5=average; 10=optimum quality habitat) for each target species. Reasons for assigning each rating were documented and discussed in the loss assessment reports. Factors other than hydroelectric development and operation that may have influenced the value- of the habitats were considered but did not affect the assigned ratings unless otherwise noted in the text of the reports.

The ratings for each target species at each time period were then divided by the optimum habitat value (10) to provide a habitat suitability index. The habitat suitability index was then multiplied by the nunber of acres of habitat available to that species at that time period to determine habitat units (HU's) available. HU's provide a relative index of the importance of the habitat to that particular species. One HU is equal to one acre of optimum quality or prime habitat for that species.

To simplify the summary of impacts resulting from construction of the Willamette projects, only losses and gains which occurred 'from the preconstruction to more recent (1979) conditions were addressed. In most cases, losses in acres of vegetation cover types were greater immediately following construction of the projects than when measured many years after completion of the projects. Natural revegetation in the portions of the affected areas which were not inundated increased available wildlife habitat at the projects between postconstruction and the present. The HU's lost or gained represent the change in the potential of the habitat to support the given species at one point in time. The impact of the dams on the habitat, however, is not limited to one point in time. The loss of the habitat and the opportunity to manage it for the benefit of wildlife, is lost for the life of the various projects.

III.B Mitigation Planning Hethodology

Development of the Willamette Basin Mitigation Plan was an evolutionary process. Little in the way of precedent was available to guide the planning process in terms of a multi-facility analysis. As already discussed, the decision was made to develop a plan for the basin as a

whole. This approach condensed the information common to all or most of the projects, and reduced the number of coordination meetings. However, it also increased the complexity and scope of specific issues in an attempt to apply them generally to all eight projects.

To maintain as much consistency as possible between the loss assessment and mitigation plan development phases of the program, as many of the same agency representatives as possible participated in development of both phases. Participants represented the USACE, as owners of the projects, the USFS and BLM whose lands surround the projects, and USFWS and ODFW, as agencies with federal and state wildlife management mandates. The lead agency for the planning process was ODFW. No tribal lands were affected by the project impacts. The NPPC, BPA, Pacific Northwest Utilities Conference Committee (PNUCC) and others attended the formal consultation meeting held on 29 May 1986 and were given the opportunity to participate in the mitigation planning process. A schedule of coordination meetings and participation is given in Appendix A, Table 1.

The decision was made to use the 12 evaluation species, discussed below, recommended in the summary report (Noyes and Potter, 1986) in development of the mitigation plan. This decision was supported by the mitigation team and presented at the 29 May 1986 formal coordination meeting (Appendix A, Table 2).

In addition to satisfying the original criteria for species selection (Section III.A), it was felt these species would have widest application to cumulative losses and mitigation site selection. Some of the original evaluation species habitat requirements were too general (e.g., black bear and cougar) while others were too specific (e.g., gray squirrel and American dipper) to be representative on the broader scale of basin planning. The inability to completely mitigate for some of the more specialized species habitat losses was accepted in the interests of the broader mitigation goal. The target species selected for mitigation planning, and a summary of specific management goals for those species, are listed in the following subsection.

III.B.l Target species and specific management goals

III.B.l.l Big game

a. Roosevelt elk: ODFW management emphasis, loss of winter range, and alteration of migration routes

Elk were reported to inhabit almost every valley and mountain range of western Oregon in the early 1800's, including the West Slope of the Cascades (Shay, 1985), but settlement and unrestricted hunting had decimated the elk population by 1900 (Mace, 1956). The availability of productive clear-cut habitat on federally-owned lands of the west slope Cascades and increasing interest in elk hunting precipitated ODFW's Roosevelt elk trapping and transplant program (Mace, 1971). Roosevelt elk transplants by ODFW date back to 1947 (Harper, 1982). Because Roosevelt elk do not readily migrate great distances to occupy new habitat, trapping and transplanting is the only way to stock suitable

habitat isolated from established herds (Mace, 1971). The goal of ODFW for Roosevelt elk population levels in the' Cascade and Coast ranges is 96,000 animals, to be achieved by transplanting elk into suitable unoccupied habitat (Pers. comm., D. Eastman, ODFW, Portland, OR).

The ODFW developed benchmark population numbers for Roosevelt elk have not been officially adopted by the Oregon Fish and Wildlife Commission, but are used by ODFW as management goals for planning purposes. The following benchmark populations have been developed for the wildlife management units in which the Willamette projects are located and were originally submitted to Willamette National Forest personnel in June 1980 (ODFW files):

Table 1: Current vs. benchmark [1] elk populations' for Roosevelt elk, Willamette Basin ODFW management units

Management Unit or Sub Unit	Wintering Elk 1986 estimates	Benchmark numbers
McKenzie	2,900	4,500
Santiam	3,000	5,900
N. Indigo	1,000	2,200

In addition to establishing habitat protection guidelines for riparian zones, streamside buffer strips, natural openings, wetlands, and old-growth coniferous forest, ODFW has also developed deer and elk cover: forage ratio guidelines (ODFW 1983a, 1985). Deer and elk summer and winter ranges should consist of 50 percent well-distributed thermal cover, at least 25 percent of which is optimal (trees >21 inches dbh for maximum snow intercept capability), and 20 percent forage areas (ODFW 1985). Specific to the West Slope Cascades, optimal thermal cover on 'each major drainage should extend 1/4 mile on each side of the stream. Forage areas should not exceed 10 acres in size and should be well-distributed (ODFW, 1985). These guidelines were submitted by ODFW to the USFS, Pacific Northwest Region in 1985 to assist with the Forest Planning Process (letter from J. Donaldson, retired Director, ODFW, 14 March 1985, Portland, OR). Big game winter range has been identified as a habitat of special concern in Oregon (ODFW, 1983a).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, well-distributed habitat must be provided to support at least a minimum number of reproductive individuals (Sirmon, 1984). Population goals for deer and elk in the Willamette National Forest are being developed in the land management plan. The existing Roosevelt elk population is approximately 6,600 animals. The optimum population is 8,400 elk, and the maximum sustainable population of Roosevelt elk in

[1] The use of this term by ODFW indicating desirable elk numbers differs from the USFS use which indicates the maximum number of elk it is possible to produce in a given area.

the Willamette National Forest is approximately 12,000 animals (Pers. comm., L. Agpaoa, USFS, 22 January 1987, Eugene, OR).

BLM has identified a population goal of 293 elk in the Santiam planning unit on BLM lands (BLM, 1979). The estimated 1979 elk population in the planning unit was 99 animals, 34 percent of the population goal (BLM, '1979). elk populations are increasing in the planning area, but severe winter weather occasionally causes elk declines in some areas (BLM, 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of Roosevelt elk (BLM, 1979); however, it does have deer and elk habitat guidelines. BLM will manage for a habitat composition of 20 percent foraging area, 30 percent escape cover, and 50 percent thermal cover within each section of BLM land (BLM, 1979). BLM will also manage for trees at least seven inches dbh in minimum densities of 250 stems per acre within deer and elk winter range, and manage for at least 60 percent crown cover in forests older than 45 years (BLM, 1979). A visual screen along roadways of at least one sight distance will be maintained to reduce human disturbance of foraging areas (BLM, 1979).

b. Black-tailed deer: ODFW management emphasis, loss of year-round habitat and winter range

ODFW has a goal to maintain a statewide population of 498,000 black-tailed deer (Pers. comm., D. Eastman, ODFW, 1980, Portland, OR). Benchmark population goals for black-tailed deer have been developed by ODFW. These benchmark figures have not been officially adopted by the Fish and Wildlife Commission, but are used by ODFW for planning purposes. The wintering deer and summer adult populations of 27,900 in the McKenzie wildlife management unit are below the benchmark of 37,000 wintering deer and summer adults (ODFW files). Current deer populations in the southern portion of the Santiam Unit meet or exceed benchmark goals (ODFW files).

The existing deer population in the Willamette National Forest is 34,500 animals (Pers. Comm., L. Agpaoa, USFS, February 4, 1987, Eugene, OR). The optimum level is approximately 30,400 deer, and maximum sustainable level within the Willamette National Forest is about 36,000 deer (Personal Comm., L. Agpaoa, February 4, 1987).

BLM has identified a population goal of 2,437 deer in the Santiam planning unit (BLM, 1979). The estimated 1979 deer population in the planning unit was 1,546 animals; 63 percent of the population goal (BLM, 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of black-tailed deer (BLM, 1979); however, it does have the deer and elk habitat guidelines identified in previous section.

A loss of 17,254 HU's was identified for black-tailed deer in the loss assessments, in addition to the 15,295 HU's identified as lost for'elk (Appendix C, Table 2). However, additional mitigation for deer was not sought in the development of this plan because 1) elk habitat was assumed to effectively encompass deer habitat, and 2) unlike elk, present deer populations are not consistently below desirable levels in all pertinent management areas.

III.B.1.2 Furbearers

C. Beaver: economic importance, loss of river and riparian habitat.

It is the policy of ODFW to manage furbearers in a manner compatible with other wildlife species and the habitat, and to achieve the highest sustained use of the resource as a commercial crop. Beaver populations will be used to a maximum degree in soil and water conservation, and at the same time, maintained at levels compatible with other resources (ODFW, 1983b).

ODFW has acknowledged riparian habitat as extremely important to fish and wildlife, and identified it as one of the most critical areas needing multiple-use planning' (ODFW, 1983a). ODFW guidelines indicate management plans should include provisions for protecting the integrity of riparian habitat and restoring degraded habitat (ODFW, 1983a). In areas where management activities have degraded riparian habitat, natural recovery should be enhanced to restore the productivity of this habitat (ODFW, 1983a).

BLM has identified a goal to maintain beaver at their present population level in the Santiam Planning Unit, which in 1979 was estimated at 79 beavers (BLM, 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of beaver; however, it does consider riparian areas and ponds important use areas due to their value as foraging, cover, and rearing areas (BLM, 1979). Policy of the BLM is to give special emphasis to management of wetland and riparian areas (Marshall, 1986).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, well-distributed habitat must be provided to support at least a minimum number of reproductive individuals (Sirmon, 1984).

b. River otter: economic importance, loss of river and riparian habitat

It is the policy of ODFW to manage furbearers in a manner compatible with other wildlife species and the habitat, and to achieve the highest sustained use of the resource as a commercial crop (ODFW, 1983b). ODFW has acknowledged riparian habitat as extremely important to fish and wildlife. ODFW guidelines indicate management plans should include provisions for protecting the integrity of riparian habitat and restoring degraded habitat (ODFW, 1983a). ODFW also has guidelines regarding streamside buffers, which are designed to provide shade for 75% of the water surface of a stream to protect fish habitat (ODFW, 1983a). Not only do the streamside buffers benefit fish, the river otter's primary prey, but they also benefit terrestrial wildlife. Streamside buffer zones for wildlife should be wide enough and dense enough with natural undergrowth to provide protected travel routes for, larger mammals, and contain mature trees and snags to provide habitat diversity (ODFW, 1983a).

BLM has identified a goal to maintain river otters at their present population level in the Santiam planning unit, which was considered "moderate" in 1979 (BLM, 1979). BLM has no areas of the Eastside Salem Unit withdrawn specifically for the management of river otters; however, it does consider riparian areas important use areas due to their value as foraging, cover, and rearing areas (BLM, 1979).

USFS regulations require that fish and wildlife habitat be managed to maintain viable populations of existing species in the planning area. To accomplish this, well-distributed habitat must be provided to support at least a minimum number of reproductive individuals (Sirmon, 1984).

III.B.1.3 Upland game

a. Ruffed grouse: represents forest upland game birds, loss of riparian habitat, recreational importance

Specific management goals for ruffed grouse populations in Oregon do not exist. Riparian habitat used by ruffed grouse, however, is recognized as providing for higher wildlife density and diversity than other habitats and, as such, is a habitat of special concern. ODFW recommends "restoration of degraded riparian habitat to at least 80 percent of potential..." (ODFW, 1985). The BLM Manual states it is BLM policy to "give full consideration to maintaining habitat diversity for all wildlife and fish species with special emphasis on management of wetland and riparian areas." (BLM cited in Marshall, 1986).

b. Band-tailed pigeon: loss of conifer forest and mineral springs, recreational importance

Specific management goals for band-tailed pigeon populations in Oregon are not available. Objectives of the Pacific Flyway management plan for the Pacific Coast band-tailed pigeon include increasing the population level such that it will safely sustain annual recreational harvests of approximately 450,000 pigeons (USFWS, 1983). ODFW lists band-tailed pigeon springs as sensitive areas and recommends that wildlife needs in these areas receive priority (ODFW, 1983a). ODFW has developed guidelines for the protection of pigeon springs (ODFW files).

C. California quail: recreational importance, loss of agricultural habitat

In the mid-1970's, ODFW's upland game management objective was to maintain the maximum number of birds compatible with other land uses (Masson and Mace, 1974). Specific management goals have not been established for Oregon. ODFW recognizes the importance of habitat diversity to provide the needs of many species of wildlife, and recommends habitat diversity be provided for in land use plans (ODFW, 1983a).

III.B.1.4 **Nongame**

a. Pileated woodpecker: indicator for cavity nestors, loss of mature conifer forest, important as a primary excavator in dead trees.

ODFW criteria for areas managed for old-growth conifer forest, old-growth species, and cavity-dwelling species, include providing sufficient habitat to maintain cavity-dwelling species at 100 percent of the population potential (ODFW, 1985). On other forest areas, habitat should be provided to maintain cavity-dwelling species above 60 percent of the population potential. To support 100 percent of maximum populations, six snags larger than 25 inches dbh are needed per 100 acres to fulfill nesting requirements (Neitro et al. 1985). The BLM Manual states it is BLM policy to "maintain habitat for viable, self-sustaining populations of cavity-nesting and snag-dependent wildlife species. This shall include the retention of selected trees, snags, and creation of new cavities, as well as selection of old-growth stands to meet habitat needs of wildlife dependent upon old-growth stands" (BLM cited in Marshall 1986). The draft management goal for pileated woodpeckers in the Willamette National Forest is to maintain a minimum of 119 habitat areas, each consisting of 300 acres of mature or old-growth forest (USFS, unpub. draft of the Proposed Land and Resource Management Plan for the Willamette National Forest, in progress, April 1987, Eugene, OR).

a. Spotted owl: sensitive species, loss of old-growth conifer forest

ODFW has identified habitat needs to maintain spotted owl populations at levels necessary to prevent listing as a Federal Threatened and Endangered species. ODFW recommendations are to maintain a minimum of 400 nesting pairs within Oregon and to provide 2,200 acres of old-growth forest habitat for each pair (J. Donaldson, retired Dir. of ODFW, Internal Position Statement on the biological requirements of the northern spotted owl, 28 March 1986, Portland, OR). Currently, spotted owl habitat areas (SOHA's) within 1-2 miles of the project areas include two at Cougar, two at Hills Creek, three at Lookout Point, one at Green Peter, and two at Detroit.

Because. old-growth forests are important to a wide variety of wildlife, ODFW recommends that 5 to 15 percent of the managed forest be maintained in old-growth status (ODFW, 1983a). The USFS Operations Manual includes a wildlife and fish habitat management objective to "give special attention to the environmental needs of threatened and endangered animal and plant species, and establish as a goal their removal, where possible, from such status by improving, protecting, and managing their habitats" (USFS cited in Marshall, 1986). The draft management goal for spotted owl in the Willamette National Forest is to provide a minimum of 78 habitat areas of approximately 2,200 acres each, evenly distributed throughout the forest. The BLM Manual states it is BLM policy to "design habitat improvements and other management actions to protect threatened, endangered, and sensitive species and their habitats" (BLM cited in Marshall, 1986). The USFWS is presently developing a plan for spotted owls as a national species of special emphasis (Pers. comm., P. Wright, USFWS, Portland, OR).

C. Bald eagle: Federally listed, endangered species, may have benefitted from project; good potential for habitat improvement in project areas

A draft recovery plan for the Pacific bald eagle population has been prepared by representatives from several State and Federal agencies comprising the Pacific States Bald Eagle Recovery Team (PSBERT). The plan identifies for Oregon a habitat and population goal to maintain 309 bald eagle territories and 210 breeding pairs (PSBERT, 1984). In 1984, five existing territories and 45 potential territories were identified for the Willamette and Umpqua Basins Zone. The habitat management goal is 45 territories, and to increase the number of breeding bald eagle pairs to thirty. Management, plans for specific sites have also been developed. The goal of the Hills Creek Reservoir Bald Eagle Management Plan (Nichols, 1983) is to provide habitat for 3 nesting pairs and numerous wintering bald eagles. The Lookout Point Reservoir Bald Eagle Management Plan includes a breeding territory at Crales Creek, a minimum of two other sites and other alternative enhancement projects **(Pers. comm.,** K. Johnson, USFS, Region 6, 9 April 1987, Portland, OR). Within the impacted project areas of Linn, Lane and Marion counties addressed in this mitigation plan, eight active bald eagle territories currently exist **(Isaacs** and Anthony, 1986).

d. Osprey: species of special interest **(USFWS),** may have benefitted from project, good potential for habitat improvement in project areas

Specific management goals, beyond maintenance of current population levels and required'habitat, have not been established for Oregon.

III.B.1.5 Waterfowl

a. Wood duck: species of special emphasis **(USFWS),** recreational . importance, loss of river bottomland habitat

Specific management goals for the wood duck in Oregon are not available. An objective for the Willamette Valley Federal Refuge Complex is to provide brood habitat for 300 wood ducks annually (Willamette Valley and Coastal Refuge Complex Staff 1980). Goals identified in **ODFW's** Willamette Valley waterfowl management plan are to maintain and enhance wintering and breeding habitat for waterfowl (ODFW, undated). Another goal is to provide a wider distribution of waterfowl by increasing the number of developed waterfowl areas throughout the Willamette Valley. Among the Willamette projects, Dexter Reservoir has moderate potential for waterfowl use to provide the desired dispersal pattern; the other reservoirs have low potential for waterfowl use **(Denney,** 1982).

III .C Planning Process

Once the overall mitigation goals were identified (see Section III.D), the Mitigation Team identified potential "key" mitigation sites. Site selection emphasized the development of future or existing big game winter range. Criteria for selection included factors such as low elevation, south aspect, gentle topography, no conflict with agricultural areas, existing elk-use, calving areas and elk accessibility. The intention, as defined by the Mitigation Team, was to identify those sites suitable for big game, with sufficient acreage to meet our winter range goal; credit the amount of "functional" old-growth and riparian habitat we could obtain on, these sites, and seek other opportunities to fulfill the outstanding old-growth and riparian, habitat mitigation goals. The key mitigation sites were located as close to the reservoirs as possible, and distributed throughout the affected area.

Negligible "on-site" (i.e., on USACE lands) mitigation opportunities were found to exist (see III.E.5, Table 2). It was determined, based on a written request to USACE for information (Letter to USACE, Portland District,,9 May 1986), the loss assessments, and the consensus of the Mitigation Team, that the narrow strips and islands of land remaining under USACE management between the roads and reservoirs, did not provide significant suitable mitigation opportunities balanced against the quality of the habitat that was lost.

Because the approach was to work outward from the impacted areas until suitable sites were found, the key mitigation sites were accepted by the Mitigation Team as being as near to "on-site" as feasible.. To distinguish these key sites, other mitigation opportunities (e.g., along the Willamette Greenway) were referred to as off-site. It was recognized that, technically, the key mitigation sites are also off-site.

It is important to note that; although the key mitigation sites possess the attributes the team was seeking in terms of habitat potential, they still are only "representative" mitigation sites at this time. If they prove unavailable for any reason, other sites, with similar attributes, would be identified to replace them.

A limited number of sites were selected for field evaluation using the same process described in the loss assessments to evaluate the original losses. During this process, the Mitigation Team assessed the relative merits of private land acquisition, easements on'private land, enhancement of publicly-owned lands, as well as other considerations. As a result of these field evaluations and the discussions and correspondence that followed, certain decisions'were made by the Mitigation Team which provided the basis for the overall direction the development of this plan has taken. They are as follows:

1. The impacted vegetation cover types (Appendix C, Table 1) were grouped into three categories which could be more readily addressed in terms of habitat loss and management needs within Oregon. These categories were: general purpose big game winter range, riparian habitat and old-growth forest.

2. The priority mitigation objective would be to replace big game winter range, since this represented the single greatest loss (see Section 111.0).

3. The mitigation potential of the key mitigation sites would be fully exploited for habitat value in all three categories before "off-site" mitigation would be proposed.

4. Mitigation credit would be given for "functional" old-growth forest on the key mitigation sites. At 90 years of age, timber stands would be credited with functional attributes and a "weighting" system was developed to facilitate the crediting (see Section IV.A.4, Table 5, pg. 52). Inherent in the decision-credit functional old-growth attributes was the recognition of trading the lower immediate habitat value, for the long-term habitat value guaranteed by public ownership under this plan.

5. It was recognized that critical big game winter range provides habitat values beyond forage and cover for elk and deer. The intent of this plan was not to focus on the mitigation for big game winter range at the expense of other habitat values. Subsequently, the habitat structural replacement goal was developed (Section III.D).

6. Since the individual projects represented habitat losses with somewhat different conditions (e.g., differences in elevation and agricultural development), the key mitigation sites should be distributed throughout the impacted areas.

7. The field habitat evaluation process indicated the most effective and productive long-term mitigative approach was the purchase of cut-over private timber lands. Enhancement of public lands results in slow mitigation gains on larger acreages because of higher existing habitat quality (refer to Section V.C for a more detailed discussion). The highest priority for private land purchase would be given to inholdings (i.e., private land at least partially surrounded by public lands) to maximize management efficiency.

8. Most elk management in the Cascade Range on USFS and BLM lands has been conducted under timber-management constraints. This mitigation plan, developed specifically for wildlife, can remove those constraints and "break new ground" by operating with the goal of optimizing elk production. An adaptive management approach is pertinent to this option.

9. A "shopping list" of mitigation sites was produced (Appendix E) based on all the mitigation options explored (Section III.E). This list represents an excess of mitigation, opportunities from which to choose depending on site availability and funding levels.

10. The Structural Replacement Goal, based on the percent of each of the three identified habitat categories lost, was approximately . 49 percent (9,935 acres) general purpose big game winter range, 25 percent (5,004 acres) riparian habitat and 26 percent (5,184 acres) old-growth forest. The goal of this plan was to replace those structural values in the same relative proportions (Section 111-D).

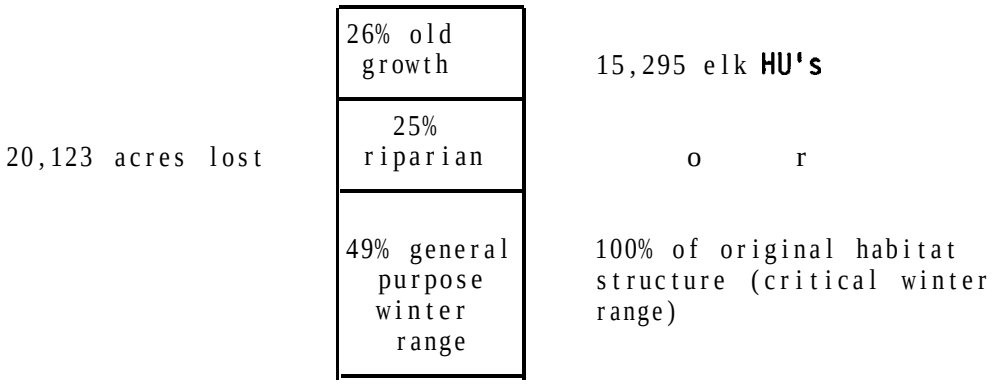
III.D Concept of the Habitat Structural Replacement Mitigation Qal

The type and proportion of vegetative cover in the preconstruction river bottomlands was critical to big game survival during severe winter conditions. These vegetation types were grouped into three mitigation categories to reflect the overall habitat values lost and more readily be addressed in terms of management objectives within Oregon. The 20,123 impacted acres of habitat that is the focus of this mitigation plan was broken down into the following categories: 9,935 acres (49 percent) of general purpose big game winter range, 5,184 acres (26 percent) of old-growth forest, and 5,004 acres (25 percent) of riparian habitat. Together, these habitat components make up "critical" big 'game winter range.

Big game winter range is at lower elevation, smaller in size, better defined than summer range, and characterized by south or west exposures and gentle topography (Thomas, 1979; and Brown, 1985). Critical big game winter range specifically refers to habitat zones within the winter, range area in which the animals can survive the harshest winters. These smaller zones of critical habitat are generally characterized by mature timber (i.e., 90+ years) and the lowest elevations in an area which are normally bottomlands.

An example of what can happen when these critical habitat zones are removed was dramatically illustrated at Green Peter Reservoir the year after the bottomlands were inundated. The winter of 1968-69 was the "most extreme on record for much of the state, with snowfalls as much as seven times above normal" (Pers. comm. Historical Data References, National Weather Service, 10 April 1987, Portland, OR). Deer accustomed to using the south and middle Santiam River bottomlands for refuge during severe weather conditions were forced down from higher elevations because of snow depth, and had no place to go. Many broke through the ice of the reservoir and were drowned (Pers. comm., J. Pesek and F. Newton, ODFW, April 10, 1987). Deer mortality was considered much higher that year than would have been expected without the presence of the reservoir (Special Report, H. Sturgis, Mid-Willamette District, 7 March 1969, ODFW files).

Because the majority of inundated habitat at the Willamette projects was considered critical big game winter range, all 20,123 acres were evaluated as potential Roosevelt elk habitat during the loss assessment phase. The cumulative loss for elk at all eight federal projects was measured as 15,295 HU's, where one HU is equal to one acre of prime elk habitat. The components of this lost habitat can be schematically represented as follows:



In addition to their importance as components of critical big game winter range, old-growth forest and riparian habitat have significant value to wildlife other than big game. By consensus, the Mitigation Team did not want to sacrifice these other values in terms of habitat value replacement.

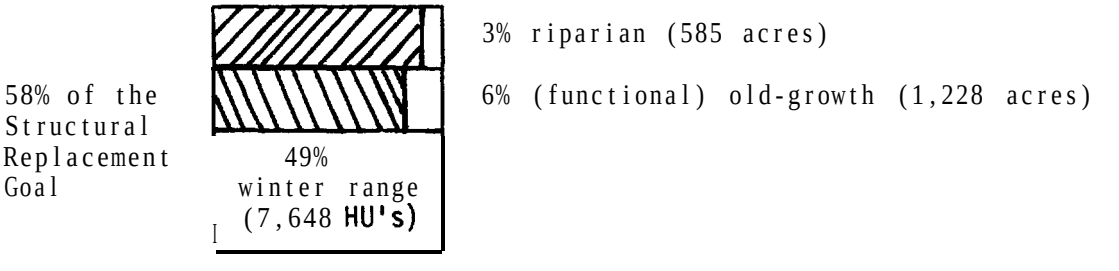
The ideal form of mitigation for these historic losses would be to replace them with habitat of equal value on nearby lands that were not flooded. Unfortunately, this is not possible now because much of the remaining low elevation lands have been developed for agricultural, industrial or residential purposes and virtually all of the old-growth forest habitat is gone at these elevations. The proposed key mitigation sites are primarily cut-over lands at higher elevation and of steeper topography.

These sites can never replace the quality of the lowland, mature forest and riparian habitat that was lost. Eventually, the stands on the mitigation sites dedicated to old-growth forest will provide optimal thermal cover for elk and provide winter habitat for all but the harshest winters. For the most part, this will take place beyond the 100-year time frame, of this mitigation plan. This replacement old-growth forest will never have the habitat quality for other wildlife species the preconstruction complex of lowland, old-growth and riparian habitat had.

Determining the replacement structure for general purpose big game winter range was relatively easy because a single evaluation species was used (Roosevelt elk). Using one HU as equal to one acre of prime elk habitat, the 20,123 acres inundated by the Willamette projects was assessed as 15,259 elk HU's lost. The 'structural replacement goal for big game winter range is 49 percent of what was lost, or 49 percent of

15,259 elk HU's. Therefore, the winter range goal is the replacement of 7,648 elk HU's. Using the habitat suitability index (HSI) range of 0 (poor) to 1.0 (prime), the average assessed value of the habitat quality at the key mitigation sites was 0.4. Because HU's are the product of quality and quantity, a considerable amount of land with an HSI of 0.4 is needed to replace 7,648 acres of prime (HSI of 1.0) elk habitat. On the representative key mitigation sites, a maximum of approximately 19,000 - 20,000 acres of cut-over forestland is needed to attain the winter range mitigation objective of 7,648 prime acres of elk habitat (at an HSI value of .4). The total amount of acreage needed would vary with the habitat quality of the land available for purchase.

Establishing the mitigation objective, using HU's, 'for the old-growth and riparian habitat- components was not as simple because of the range of evaluation species to whom these habitats were important. The replacement of the old-growth and riparian wildlife values is achieved more slowly than that of winter range. At the point the 49 percent winter range goal is achieved through mitigation on the key mitigation sites (i.e., on 20,000 acres), only about 585 acres of the riparian and 1,228 acres of the (functional) old-growth (see Section III.C, Number 4, Pg. 19) mitigation objectives are met (Tab-'2). This represents 3 percent of the overall structural replacement goal in riparian values and 6 percent of the overall structural replacement goal is in old-growth forest values. The projected mitigation' values gained at the key mitigation sites can be represented schematically as follows:



Because of their value to a large number of wildlife species and their increasing scarcity, the Mitigation Team agreed to credit old-growth and riparian habitat on an acre-for-acre exchange basis for the off-site mitigation objective. The objective was to replace the outstanding debt for these two habitat components, with prime existing habitat (e.g., the Willamette River Greenway) to the extent possible. The total concept is summarized as follows:

Structural Replacement Goal	Mitigation Objective (HU's and acreage goals)	% of structural goal achieved on key mitigation sites [1]	Outstanding debt for "offsite" mitigation
1 49% winter range	2 7,648 elk HU's (19,000-20,000 acres)	3 49%	4 -0-
25% riparian habitat	5,004 acres of prime existing habitat	3% (585 acres)	22% (approx. 4,400 acres)
26% old-growth forest	5,184 acres of prime existing habitat	6% (1,228 acres)	20% (3,900 acres)
100% Mitigation for Lost Habitat Values	Maximum total land purchase = 28,000 acres (see column 4)	58%	+ 42% = 100%

1 Crediting system for riparian and old-growth forest on key mitigation sites identified in footnotes c and d of Table 2.

III.E Hitigation Options

During the planning process, an attempt was made to identify all of the possible mitigation options available in the Willamette Basin. This approach was taken in order to provide as flexible a plan as possible to meet future contingencies. The options were placed under one of four headings; big game winter range, riparian habitat, old-growth forest, and, enhancement and other options. Opportunities that directly offset losses resulting from the Willamette projects were placed under the appropriate habitat category. Mitigation opportunities important to identified habitat needs in Oregon and the Willamette Basin, but not directly related to the losses, or less productive than other means, were listed under the enhancement category. Options listed under the enhancement heading may be substituted for opportunities in the other headings if the recommended goals cannot be attained, or if availability, funding, and the habitat value gains indicate it is appropriate. The identified mitigation options are outlined as follows:

III.E.l Big game winter range

a) Purchase cut-over, private timber lands as close to the project areas as possible. These are the potential key mitigation sites.

b) Land exchanges with private timber companies. This option is dependent on cooperative agreements with land-management agencies such as USFS, BLM and the State Forestry Department.

c) Purchase easements on private lands for big game winter range (includes deferred cutting or longer rotations and other alternatives other than purchase or exchange). This avenue needs to be explored in more detail with the various individuals and companies that own timber lands in the planning area. The time frame for an easement would be a minimum of 100 years except under special circumstances.

III.E.2 Riparian habitat

a) Enhancement opportunities on project lands, such as tributary enhancement at Green Peter and Foster, or planting the drawdown tones. Few enhancement opportunities were identified during development of the plan.

b) Credit and enhancement of riparian habitat obtained by the purchase of key mitigation sites.

c) Purchase private lands along the Willamette River Greenway. This was considered by the mitigation team to be the most valuable off-site mitigation option for riparian habitat. Oregon State Parks has management goals for both general-use and primitive recreational opportunities along the projected Willamette Greenway: Numerous potential properties have been identified (Appendix H) and 10 have been prioritized in terms of mutual benefits for wildlife and recreation. These sites would be managed by State Parks.

III.E.3 Old-growth forest

a) Credit "functional" old growth on key mitigation sites. The true old-growth habitat value would not be realized during the time frame of this mitigation plan.

b) Purchase existing old-growth forest sites (i.e., 150+ years). Old-growth forest, particularly at low elevation, is extremely scarce and expensive. The Mitigation Team was able to identify very few potential purchase sites (Table 2). It is difficult to specify an average cost for an acre of old-growth (i.e., timber value) at present, for a number of reasons, including the variation in site volume (i.e., size and density of trees), topography, amount of decadence (i.e., disease and number of dead or dying trees), and the fluctuation in market value over the last five to seven years. Seven years ago, a cost of $50,000 per acre of old-growth was not unusual. Currently, the value for the same acre may be around $20,000-30,000. A "best guess" estimate for the average cost of an acre of old-growth currently is $18,000-20,000 (Pers. comm., J. Mayo, USFS, Willamette National Forest,, 14 April 1987, Eugene, OR). Appraisal fees of between $5,000- $14,000 per parcel of land must be added to the overall cost (Pers. comm., D. Scherzinger, Realty Div., ODFW, 14 April, 1987, Portland, OR). In addition, between $300-500 per acre must be added for the cost of the land. Total cost per acre could exceed $30,500.

III.E.4 Enhancement and other options

a) Enhance USFS and BLM lands to improve big game survivability (e.g., forage seeding and longer harvest rotations).

2. Enhance the Willamette River Greenway, State Parks lands. Proposed enhancement activities include removal of a parking lot, dredging and shoreline stabilization (consistent with Section 404 of the Clean Water Act) which would enhance the existing wildlife habitat values by increasing the vegetation component, preventing erosion and the unauthorized public use of. islands.

3. Enhance the drawdown zones around the reservoirs, specifically around Hills Creek and Green Peter, to provide green forage for elk during the winter months as well as other wildlife benefits.

4. Enhancement of publicly-owned wetlands, such as providing waterfowl nesting and food sources.

b) 1. Purchase privately-owned second-growth forest, (i.e., 40 years or older) preferably along big game travel corridors, to eventually provide old-growth forest (i.e., 150+ years). A "best guess" estimate for the average cost of an acre of 40-year old Douglas fir is between $5,000-10,000, taking into consideration the development costs at this age (i.e., site development, planting, fertilization, pre-commercial and commercial thinning). (Pers. Comm., J. Mayo, USFS, Willamette National Forest, 14 April 1987, Eugene, OR). Appraisal fees per parcel and land costs must be added to the overall price. Total cost per acre could be as high as $15,000.

c) Purchase of privately-owned wetlands. Although project impacts to wetlands were minimal, wetlands are a diminishing, scarce resource of high wildlife value and current management need.

III.E.5

Table 2: Summary of Mitigation Opportunities and Habitat Goals

Mitigation opportunities (sites)	Costs[a] (X 10^3)	HABITAT COMPONENTS: General use winter range — Acres	Habitat units	% ofb HU goal	Riparian habitat — Acres[c]	% of Acreage goal (i.e., 5,004 acres)	Old-growth forest — Acres[d]	% of Acreage goal (i.e., 5,184 acres)
KEY MITIGATION SITES[e]								
1. Middle Santiam	3,100	2,600	1,820	11.9	180	3.6	156	3.0
2. Rumbaugh Creek	1,100	1,220	732	4.8	27	0.5	73	1.4
3. Three Creeks	400	560	224	1.5	36	0.7	34	0.6
4. Simpson Creek	4,600	7,080	2,124	13.9	72	1.4	425	8.2
5. Pioneer Gulch	1,200	1,640	328	2.1	36	0.7	98	1.9
6. Blowout Creek	800	640	320	2.1	54	1.1	38	0.7
7. Whitewater Creek	1,200	960	384	2.5	36	0.7	58	1.1
8. Quartz Creek	3,744	5,760	1,728	11.3	144	2.9	346	6.7
Subtotal	16,144	20,460	7,660	50.1	585	11.6	1,228	23.6
*Winter Range Goal			(100% acreage goal)					
9. Green Butte[f]		8,960	3,584	23.4				
10. Long Ranch		60	24	0.2	-unknown-			-0-
11. South Santiam #1		86	34	0.2				
12. " " #2		360	144	0.9				
13. " " #3		405	162	1.1				
14. " " #4		143	57	0.4				
15. " " #5		268	107	0.7				
16. Pamelia Creek		640	256	1.7				
17. Idanha #1		360	144	0.9				
18. " #2		80	32	0.2				
19. " #3		960	384	2.5				
20. Pigeon Prairie		1,040	416	2.7				
21. Whitcomb Creek		640	256	1.7				
22. Grassy Glade		1,020	408	2.7				
Subtotal		15,022	6,008	39.3				
TOTAL		35,482	15,460	89.4	585	11.6	1,228	23.6

Mitigation opportunities (sites)	Costs[a] (X 10^3)	HABITAT COMPONENTS: General use winter range — Acres	General use winter range — Habitat units	General use winter range — % ofb HU goal	Riparian habitat — Acres[c]	Riparian habitat — % of Acreage goal (i.e., 5,004 acres)	Old-growth forest — Acres[d]	Old-growth forest — % of Acreage goal (i.e., 5,184 acres)
WILLAMETTE GREENWAY[g]								
1. Ingram/Morgan Is.	412.5	275			275	5.5		
2. Bowers Rocks	450	300			300	6.0		
3. Hayden Island	405	270			270	5.4		
4. American Island	202.5	134			135	2.7		
5. Jackson Bend	127.5	86			85	1.7		
6. Beacon Landing	502.5	335			335	6.7		
7. Keizer Bar	82.5	54			55	1.1		
8. Snaggy Bend Bar	127.5	85			85	1.7		
9. Lambert Slough	52.5	37			35	0.7		
10. American Bottoms	75	50			50	1.0		
11. McKenzie Island	352.5	235			235	4.7		
12. Pudding Creek	82.5	191			55	1.1		
13. Camas Swale	52.5	37			35	0.7		
SUBTOTAL	2,925				1,950	39.0		
TOTAC					2,535	50.7		
14. Candiani Island		67						
15. Five Island		86						
16. Grand Island		140						
17. Wheatland Bar		--						
18. Windsor Island								
19. Independence Bend		1::						
20. Kentucky Bar		89						
21. Tyson Island		--						

Mitigation opportunities (sites)	Costs[a] (X 10^3)	HABITAT COMPONENTS: General use winter range — Acres	General use winter range — Habitat units	General use winter range — % ofb HU goal	Riparian habitat — Acres[c]	Riparian habitat — % of Acreage goal (i.e., 5,004 acres)	Old-growth forest — Acres[d]	Old-growth forest — % of Acreage goal (i.e., 5,184 acres)
WILLAMETTE GREENWAY (Continued)								
22. Keesneck Lake		--						
23. Santiam Confluence		19						
24. Upper Santiam Bar		135						
25. Black Dog Island		61						
26. Half -Moon Bend		113						
27. Irish Bend		106						
28. -Marshall Is., So.		--						
29. Fall Creek Confluence		268						
30. Other Greenway Sites (not identified)		--						
Subtotal	3,704				2,469	49.3		
TOTAL	6,629				5,004	100.0		
*Riparian goal								
OLD-GROWTH FOREST								
I. Mary's River	1,000						250	4.8
2. Corvallis watersh.	19,260						963	18.6
3. N. Fk. Wilson R.	8,000						400	31.1
Subtotal	28,260						1,613	45.2
4. Unidentified sites	46,860						2,343	45.2
TOTAL (for true old-growth)	75,120						5,184	100

Mitigation opportunities (sites)	Costs[a] (X 103)	HABITAT COMPONENTS: General use winter range — Acres	General use winter range — Habitat units	General use winter range — % ofb HU goal	Riparian habitat — Acres[c]	Riparian habitat — % of Acreage goal (i.e., 5,004 acres)	Old-growth forest — Acres[d]	Old-growth forest — % of Acreage goal (i.e., 5,184 acres)
*Old-growth goal (i.e., direct replacement)								
ENHANCEMENT AND OTHER OPTIONS[h]								
1. Potential old-growth option								
a) 40-yr old Second growth sites (not identified)i							5,934	76.3
SUBTOTAL								
T O T A L	29,670-59,340						7,162	100
*Old growth replacement (i.e., indirect replacement)								
2. Forage seed & fertilize (per 1,000 acres)								
a) Reservoir draw-down	85	per 1,000 acres	200	1.3				
b) Natl. Forest clearcuts				2.6				
c) Private clearcuts	85		400	2.0				
3. Enhance winter range on Natl. Forest land								
4. Greenway Enhance-ment								
a) Coalca (asphalt removal)	10							
b) McKenzie Is. (dredge)	5							

Mitigation opportunities (sites)	Costs[a] (X 103)	HABIT-AT COMPONENTS: General use winter range — Acres	General use winter range — Habitat units	General use winter range — % ofb HU goal	Riparian habitat — Acres[c]	Riparian habitat — % of Acreage goal (i.e., 5,004 acres)	Old-growth forest — Acres[d]	Old-growth forest — % of Acreage goal (i.e., 5,184 acres)
c) Grand Island (reveg)	150							
d) Luckiamute (rip-rap)	100				1,200 ft.			
e) Yamhill (riprap)	150				1,000 ft.			
f) Elijah Bristow (reveg)	50							
5. Purchase riparian sites beyond identified goal								
6. Wetland Enhance-ment								
a) Wiseman(Miller)Island(ODFW)								
b) Green Peter (Corps)								
1. Upper flats								
2. Rumbaugh Cr.								
3. Thistle Cr. (Sec. 26)								
4. Thistle Cr. (Sec. 36)								
c) Foster (Corps)								
1. Cool Creek								
2. Section 24								
d) Fern Ridge (Corps)								

Mitigation opportunities (sites)	Costs[a] (X 10^3)	HABITAT COMPONENTS: General use winter range — Acres	General use winter range — Habitat units	General use winter range — % of HU goal	Riparian habitat — Acres[c]	Riparian habitat — % of Acreage goal (i.e., 5,004 acres)	Old-growth forest — Acres[d]	Old-growth forest — % of Acreage goal (i.e., 5,184 acres)
7. Wetland purchase[j]								
a) Cox Butte	560							
b) Richardson's Gap	2,400							
c) Big Slash-Diamond K	2,000							
d) Hedges Creek								
e) Other sites								

a Costs for key mitigation (winter range) sites are based on 1986 costs for 1978 stand conditions and are a maximum. Estimates based on more current conditions could be nearlv $2M less for kev sites. Willamette Greenwav costs are $1,500 per acre. Old growth costs are $4,000 per acre for the Mary's River site and $20,000 per acre for true old-growth. Second-growth (40 years) is $5,000-10,000 per acre. Appraisal fees are not included in the cost estimates.

b Winter range goal based on elk Habitat Units gained through enhancement. Riparian and old-growth goals are acre-for-acre replacement.

c Based on 36 acres per stream mile.

d 30% of-the dedicated old-growth area on key mitigation sites was credited as "functional" old growth following the weighting procedure in Table 5 of Section IV.A.6.3 - see Glossary for definition of "functional old growth.

e Key mitigation sites have opportunities for winter range, riparian and old growth goals and are located near the impacted areas. Sites were field evaluated.

f Habitat value of sites 9-22 is based on the average of 8 evaluated sites. Costs are not provided because stand conditions are not known.

g The consensus of the Mitigatibn Team was that the Willamette River Greenway represented the highest mitigation value and habitat protection need for riparian habitat. See Appendix H for further information on these sites.

h Opportunities that meet current management needs within Oregon, may be lower cost than first priority goals, and may be substituted for any of the 3 mitigation goals.

i Based on option of mitigating for outstanding old-growth debt not obtained on key mitigation sites (i.e., 3,956 acres) by purchasing 40-yr second-growth. Using same weighting system as on key mitigation sites (Table 5, Section IV.A.6.3) total replacement acreage required = 5,934 acres @ $5,000-10,000/acre. In this scenario, the earliest old-growth condition is achieved approximately 80 years after purchase.

j Trade-off value not determined.

III.E.6 Mitigation accounting

III.E.6.1 Winter range

The preconstruction habitat represented valuable critical winter range (Section II.D), with a high habitat for elk, the species used to evaluate the winter range attributes of the key mitigation sites. Deer were considered to be essentially encompassed by elk HU's, even though, the HU loss for deer was slightly greater (Appendix C, Table 2). These key mitigation sites represented cut-over big game winter range with a low current habitat value for elk. The average habitat rating of the cut-over lands was less than half the value of the preconstruction habitat. Therefore, approximately twice as much of the lower quality habitat is required to replace it.

Based on the structural replacement goal (Section III.D), the total loss of 15,295 Roosevelt elk HU's was multiplied by 49 percent (i.e., the structural replacement goal for winter range) to obtain the objective of 7,648 HU's (or 7,648 acres of prime elk habitat). Taking into consideration the representative nature of the key mitigation sites, approximately 20,000 acres of cut-over land would be needed for winter range mitigation.

The proposed mitigation plan is intended to mitigate for the expected life of the construction projects, usually accepted as 100 years. The mitigation lands will not approach the quality and suitability of the preconstruction habitat until near the end or, perhaps, long after the 100-year period. For example, "as a generality, old-growth tree and stand characteristics emerge at about 200 years" (Gordon et al. 1982). Luman and Nietro (1980) specify old-growth forests as being 300 years or older "exhibiting some signs of decadence." Because of differences in elevation, present land-use pressures, and other factors, the Mitigation Team determined that some of the mitigation sites will never achieve a habitat rating greater than six or seven, while some may have the potential of reaching an optimal level.

III-E.6.2 Riparian habitat and old growth

General

The Mitigation Team decided to credit these two habitat components on an acre-for-acre basis: one preconstruction acre for one, essentially prime existing acre, if the existing acres could be found. This decision was based on the following reasons:

1. Riparian and old-growth forest are scarce and important wildlife habitats with high current management needs. We feel we are justified in crediting full mitigation value in exchange for protected status because all sites in these habitat categories are threatened by development or other uses.

2. Under the present physical environmental constraints (Section III.D), it is extremely difficult to mitigate for all HU's lost by the entire range of evaluation species. In terms of the traditional mitigation concept, which requires improvement of an existing habitat to count toward mitigation, the amount of 1 and required for mitigation under this plan would be far greater than if we were to give credit on an acre-for-acre basis. Full mitigation will not be achieved for all species. It was felt however, that over the long-term the protected status of these habitats would offset this disadvantage.

Riparian

The decision was made to credit riparian values on the key mitigation sites on an acre-for-acre basis. This was based on the potential for production of high quality riparian habitat, minus the old-growth component, in a relatively short time (i.e., 20 years) in the Cascades; and because the riparian component available on the key mitigation sites was quite limited.

Riparian habitat was credited at a rate of 36 acres per stream mile (i.e., 5,280 foot length by 300 foot width). Using this rate, approximately 600 acres, or three percent of the structural replacement goal was met on the key mitigation sites.

The Willamette River Greenway, i.e., those lands identified within the Greenway Plan Boundaries (ODOT, 19761, was selected by consensus of the Mitigation Team as the priority area for a mitigation exchange. Therefore, it was proposed that the 4,400 acres of riparian habitat not mitigated for on the key mitigation sites (see Section III.D) be exchanged for 4,400 acres of prime existing, and threatened habitat along the Greenway (see Section IV.A).

Old-growth forest

At this time, relatively little available, prime old-growth forest has been identified to fulfill the outstanding mitigation goal for this habitat category on an acre-for-acre exchange basis. This is discussed in detail in Section IV.A.2.d, and shows the opportunities to mitigate for this habitat loss are much more restricted than for riparian habitat or big game winter range.

The crediting of functional old-growth (III.c (d)) on the key mitigation sites, to provide for a future old-growth habitat component, took the following considerations into account:

1. The mitigation team agreed to credit functional old-growth at 90 years, because at that age it provides optimal thermal cover for elk and possesses some attributes approaching those of old-growth. For example, there will be pileated woodpecker use in a 90-year old forest, providing the conditions are such that some trees with a d.b.h. of 20 inches are produced (Thomas, 1979; R. Mannan, 1984 in Marshall, 1986).

2. The decision was made to dedicate 30 percent of the key mitigation sites for optimal thermal cover and old-growth, simultaneously.

3. The concept of crediting functional old-growth was tied to the purchase of key mitigation sites. True old-growth status is not achieved until a stand reaches 200-300 years of age, or at a minimum, possesses 15 trees per acre with a d.b.h. greater than 21 inches, two or more canopy levels and identifiable signs of decadence (Thomas, 1979). The credit was given with the inherent understanding that the 30 percent dedicated old-growth component on each site would achieve old-growth characteristics some time in the future, with the protection of public ownership (Figure 2).

4. A "weighting" system was developed to establish the amount of mitigation credit that would be given for the various ages of second-growth timber that might be found on mitigation sites (Section IV.A.8, Table 5). Credit was given for the length of time trees dedicated as old-growth forest would be 90 years or older within the time frame of the mitigation plan.

5. On average, the evaluated key mitigation sites represented second growth timber, about 10 years old. These timber stands were weighted at a value of .2 per acre, which means they would be considered as functional old-growth for only 20 years of the 100-year mitigation plan.

6. Using these weighted values, approximately 1,200 acres of the old-growth forest acreage goal was achieved on the key mitigation sites (Section III.E.5, Table 2). This credited acreage could be higher.

7. Because of the long time-lag factor, the crediting of functional old-growth is not effectively mitigating for those lost habitat values during the scope of this plan.

III.E.6.3 Enhancement and other mitigation options

A crediting system has not yet been worked out for the diverse options that come under this category. It represents a contingency plan which provides flexibility to the basic mitigation plan. Options, such as asphalt removal from State Park lands, building a bridge for access to plant waterfowl feed on Wiseman Island, and the

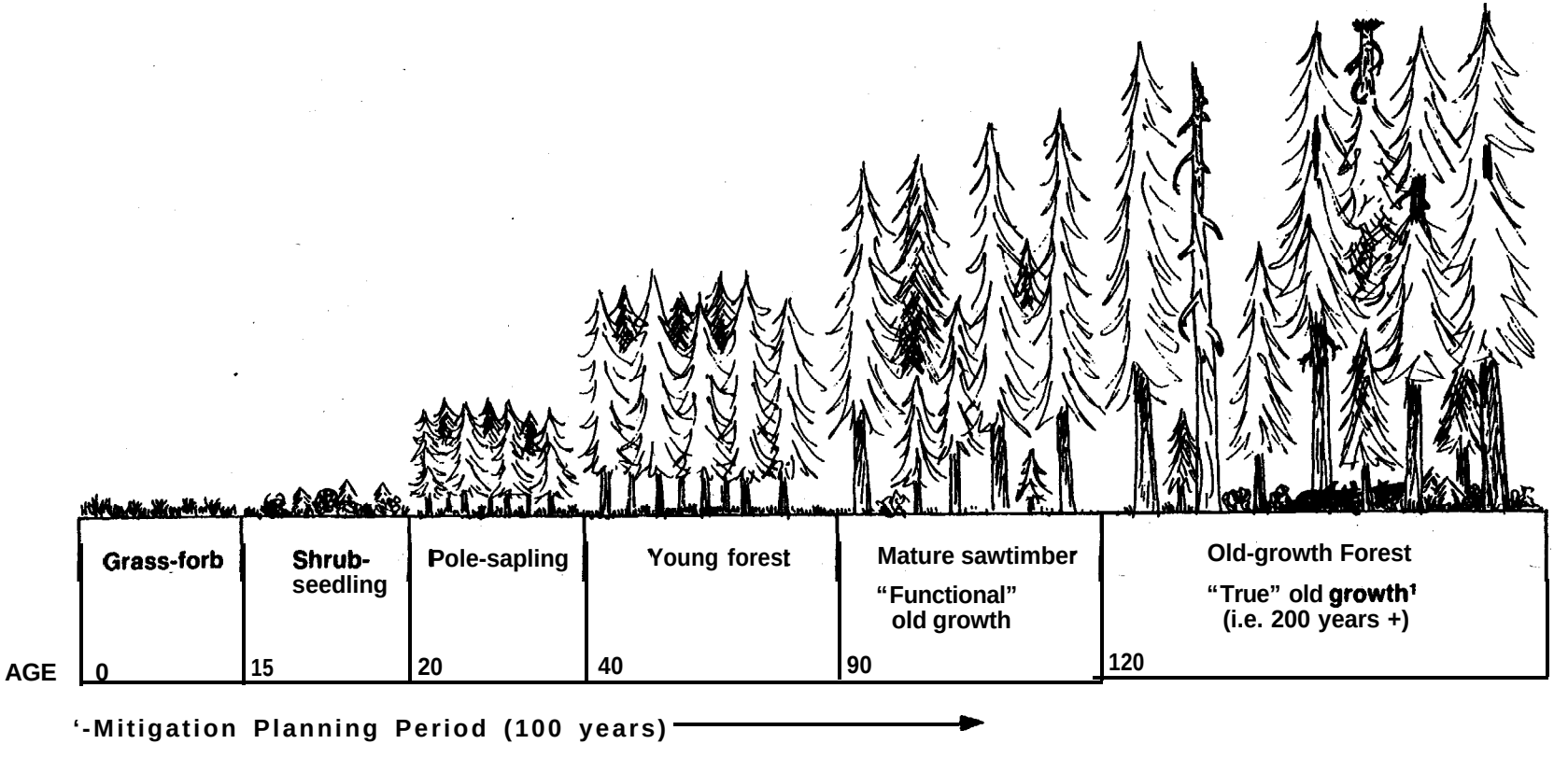


Figure 2. **The position "functional" old-growth holds relative to the full spectrum of forest development**

1) The structural features of a forest are more import&t than age measurements in determining old-growth status (Gordon et al. 1982).

purchase of "out-of-kind" mitigation such as wetlands, would obviously enhance wildlife habitat, but they are difficult to evaluate in terms of mitigation goals.

III.E.6.4 Osprey, bald eagle and waterfowl gains

The Interagency evaluation team determined reservoir construction resulted in a cumulative habitat gain of +5,693 HU's for bald eagle and of +6,169 HU's for osprey (see Section II.B.3). The major reason for the habitat value increase was the expanded prey base provided by fish production and, some increased waterfowl use of the reservoirs. Preconstruction conditions provided ideal nesting and roosting due to the old-growth and riparian habitat components, but a limited prey base, and restricted access to the relatively narrow, riverine habitat. Postconstruction conditions resulted in elimination of much of the optimum nesting and roosting opportunities, but greatly expanded the year-round food supply and improved foraging access for these large raptors.

During the loss assessment phase, USACE (1984) recommended dropping either bald eagle or osprey from the list of evaluation species because of their habitat overlap. Both species are typically dependent on mature forest, and prey signficantly on fish. Although the mitigation team recognized this overlap, both species were retained for several reasons:

1. Osprey are more dependent on large bodies of water than are eagles. Eagles also were used to assess the attributes of wintering habitat in the project areas.

2. During the planning phase, the Mitigation Team did not want to underestimate the potential benefits that might have resulted from the projects.

3. Bald eagles are classified on both the federal and state level as "threatened" in Oregon, and the osprey is on the USFWS (1982) list of national species of special emphasis, with management interest in the population in Oregon.

Consistent with the conservative approach to mitigation under this plan, we have taken into consideration the habitat overlap of these species. We feel that, for lack of a better scale, bald eagle has, probably three quarters overlapping habitat needs with osprey. This would leave a combined total of 7,235 HU's (5,693+1,542) gained for bald eagle and osprey at the reservoir. This is consistent with how we credited the loss of 15,295 HU's for elk, and the loss of 17,254' HU's for deer. In the latter case, we made the general assumption that elk habitat effectively encompassed deer habitat, even though total deer losses were actually greater than for elk. We chose to mitigate for the elk losses only. This is obviously an over-simplification of biological considerations, but greatly facilitated the planning process.

The losses for which this plan has.been unable to mitigate far outweigh any habitat gains provided by the projects. The unmitigable losses can be described as falling into two categories: intangible and tangible.

Intangible Losses

These considerations are beyond the control of the mitigation plan and include the fact that the habitat values lost cannot be effectively recovered on-site. Although 100 percent mitigation for the documented losses would be achieved per se, by fulfilling the structural replacement goal of this plan, it is not direct replacement of equal value. For example, mitigation is not in the area of direct impact; less than optimum current habitat (e.g., functional old-growth) is traded for the future benefits of'protection; and not all species impacted are provided full mitigation.

Another intangible loss is the impact of the projects over time. By basing the loss assessments on recent conditions relative to the preconstruction quality, we have credited 24-40 years of natural habitat recovery since construction. This evaluation system does not realistically account for the time-lag in vegetation recovery, and the loss of habitat value during that period, to all wildlife species that were potentially affected.

Tangible Losses

Shortfalls' in the mitigation plan caused by present habitat constraints that cannot be easily overcome, are summarized as follows:

1. The "functional" old-growth credit is weighted to account for the number of years the trees on a specific mitigation site are 90 years and older. At no time during the scope of the plan (i.e., 100 years) are they true old-growth. The delay of habitat value has been accepted as a trade for future protection.

2. At this time, insufficient old-growth habitat has been identified to meet the structural replacement goal. There is a certain amount of this valuable habitat that is unmitigable under existing conditions. The only avenues for mitigation beyond direct replacement for this habitat are to buy second-growth forest and let it grow, or to trade the values for other, out-of-kind, wildlife habitat of high current need (see Section IV.A.2(d)). In either of these latter scenarios, some degree of loss is sustained.

3. The decision to seek riparian values on the Willamette River Greenway was made to give protection to threatened, valuable habitat with current management needs. Although benefitting many nongame species and upland game birds, the specific habitat needs of many of the original evaluation species, such as fast-flowing mountain streams used by harlequin ducks and the American dipper, are hot fully being met.

Although it is difficult to quantify some of the unmitigable losses under this plan and apply "equivalency" values, it is felt these losses essentially cancel out the gains for bald eagles, osprey and waterfowl.

IV. RESULTS

IV.A. Mitigation Plan: Preferred Alternative

IV.A.1 Introduction

The proposed mitigation plan focuses on what can be done under present environmental constraints to recover the overall value of the habitat lost, rather than equal replacement in habitat units for all evaluation species. This latter proposal would be the ideal solution, but is impractical because intact, "equal" habitat no longer exists within the Willamette Basin. The preferred mitigation alternative of replacing the structural integrity of what was lost appears to best meet the following mitigation objectives:

a. To protect sufficient habitat through purchase, easement and enhancement; to compensate for the value of the habitat directly impacted; and to regain concomitant lost management opportunities.

b. Select those mitigation opportunities which would, first of all, address the specific losses sustained (i.e., replacement of winter range, riparian and old-growth forest components), while at the same time benefitting the largest number of species possible, and taking into consideration current habitat and wildlife management needs.

c. Provide sufficient flexibility for achieving mitigation within the Willamette Basin, while allowing for the large number of "unknowns" (e.g., availability of preferred mitigation sites, schedule of funding, fluctuations in cost of old-growth forest lands).

IV.A.2 Methodology

The preferred mitigation alternative is composed of six major elements. These elements incorporate on- and off-site strategies to recover all three components of the structural replacement goal, The first objective of this mitigation plan was the replacement of big game winter range, as close to the projects as possible. As much mitigation credit as possible was given for the riparian and old-growth habitat components on the key mitigation sites. Beyond this, the most effective mitigation opportunities were sought to fulfill the outstanding debt of riparian habitat and old-growth forest. The six elements are a through f, as follows:

a. Acquire long-term management rights or purchase cut-over forest land that would become key mitigation sites, distributed equitably throughout the affected areas. These sites would primarily provide mitigation for big game winter range that would improve with time, and also provide some riparian and. future old-growth values. Approximately 20,000 acres of land have been identified in this plan as possessing those attributes needed to eventually provide winter range benefits to elk (Table 2). If available, these 20,000 acres would satisfy the acreage goal of this plan for big game winter range. (Section III.D). The cost would be approximately $16 million (Table 2).

b. Improvement and management of these key mitigation sites to maximize big game winter range values (Section IV.A.8).

C. Purchase private lands along the Willamette River Grcenway to fulfill the remaining habitat replacement goal for riparian habitat. The 20,000 acres currently identified as desireable key mitigation sites contain approximately 585 acres of existing or potential riparian habitat. This plan recommends the purchase of about 4,400 acres of private land along the Willamette River that has high, current habitat value to wildlife. Nunerous sites were identified (Appendix H) within the Greenway Plan boundaries (ODOT, 1976), and other sites exist that would, if available from willing sellers, satisfy the acreage goal of this plan for riparian habitat. The cost would be approximately $6-7 million.

d. Acquisition of existing old-growth forest land for direct replacement of habitat value, the primary objective of structural replacement concept (see Section II.D); acquisition of second-growth forest land for eventual replacement of a significant portion of the old-growth habitat value; or maximization of mitigative value in terms of current habitat value, scarcity, and benefit to the greatest number of species.

There is no resolution among the agencies as to what the "best" way is of dealing with the outstanding debt (i.e., 3,956 prime acres) of old-growth forest. The loss of 5,184 acres is real and, ideally, the goal would be to replace it equally. The dilemma results from the fact that old growth has become 1) extremely scarce, and 2) extremely expensive. The divergence of thought on this subject revolve around the significant differences between the magnitude of the habitat value lost, the magnitude of current need, and the magnitude of the cost of habitat value replacement.

Scarcity and high cost are factors we have no control over, and represent the constraints within which a plan must be developed. It is the mitigation team's opinion that we cannot hope to fully rectify past oversights with the resources at hand (i.e., BPA money and available habitat). If the old growth had been replaced 25-40 years ago on an incremental basis - as it was lost - which would have been consistent with today's environmental ethics and laws, the problem would not have grown to unmanageable proportions.

There is consensus among the agencies as to the structural replacement goal, the methods of achieving mitigation for winter range and riparian values, and the crediting of functional old growth values on the key mitigation sites (i.e., 1,228 acres). Differing points of view on how to achieve the structural replacement goal for old-growth forest have resulted in a number of possible options; any one of which, or combination of all three, could be used.

Option 1'

Purchase approximately 3,956 acres (i.e., 5,184-1,228 = 3,956) of Douglas fir forest land with the majority of the timber stand being at least 150-200 years old and possessing the physical attributes of true old-growth forest (Luman and Neitro, 1980; Thomas, 1979).

On the basis of a preliminary assessment, it does not appear that this many acres of privately-owned old-growth either exists or would be available for purchase. Currently, only about 1,600 acres has even been identified (Table 2).

The cost of this option for total old-growth replacement at current timber prices would be at least $80 million (i.e., $20,000 per acre + appraisal and land costs). This would be in addition to the approximately $22 million needed to purchase the key mitigation sites and riparian habitat mitigation lands (Table 2).

Option 2

Purchase second-growth forest land (i.e., 40 years old) for eventual replacement of a significant portion of the old-growth habitat value lost. Because a 40-year old timber stand does not equal true old-growth, this option would require more acreage to fulfill the replacement goal of 3,956 acres. Credited on the weighting system developed for the key mitigation sites (Table 5, pg. 52), approximately 5,934 acres of second-growth would need to be purchased in addition to the key mitigation sites. This weighting system credits, the maturation of a sample 40-year second-growth stand into functional old-growth, after 50 years. The sample stand will be 140 years old at the end of the 100 year mitigation period. As with functional old-growth on the key mitigation sites, which will probably be only about 120 years old at the end of the mitigation period, the loss of short-term habitat values are traded for the long-term protection of the resource.

The cost of this option, at current timber prices, could range from a minimum of about $32 million to a maximum of about $61 million (i.e., $5,000-10,000/acre + appraisal and land, costs), in addition to the cost of the key mitigation sites and riparian habitat.

Option 3

This option attempts to balance the need to replace exactly what was lost (i.e., true old-growth forest values) against realistic opportunities and potential gains. The Mitigation Team felt that mitigation funds should be allocated for the replacement of the lost resources to the extent possible. The unique character of old-growth forests, and the unmitigable nature of this habitat loss, created a special problem in the development of this mitigation plan. Considering the high cost of replacing the outstanding old-growth values, even by the purchase of younger timber, it was felt more flexibility was needed to achieve a reasonable level of mitigation for a reasonable cost. In addition, the limited amount of

private timber land available for purchase, regardless -of stand structure, needed to be considered.

The very high costs of options one and two make achieving the mitigation goal for old-growth, exclusively by direct or indirect replacement, unrealistic. It is too late to fully mitigate for these lost habitat values because, in the interim, the resource has become very scarce and very expensive. Defininq what proportion of the outstanding old-growth debt would constitute acceptable or adequate mitigation is very difficult.

One approach would be to arbitrarily take 25 percent of the average value of options one and two (approximately $20 million), accepting the inability to fully mitigate for this resource under today's constraints. This funding would then be used to maximize the wildlife mitigation opportunities of this plan and at the same time take into consideration high current wildlife habitat needs within Oregon. The importance of this option is to maintain flexibility in the mitigation approach. This would allow for exploitation of opportunities which would maximize either the quantity or quality of habitat obtainable, or benefit the largest number of species. For example, if it is possible to purchase a valuable stand of old-growth for $4,000-8,000 per acre (see Appendix I), this should be a priority. The primary objective would be to purchase true old-growth or second-growth forest. However, at the cost of $30,000 to $40,000 per acre, purchase of timber lands (even if available) may not be 1) the most cost-effective way to spend mitigation dollars; or 2) the most biologically effective alternative in terms of mitigating for the overwhelming magnitude of the loss, or benefitting the greatest number of species.

Subsequently, this option recommends the dedication of $20 million for partial mitigation of the old-growth forest habitat lost, to be spent in the most cost-effective manner on the following order of categories:

1) Scarce valuable habitat with emphasis placed on direct or indirect replacement of old-growth forest land.

2) Other scarce valuable habitat (e.g., wetlands) or habitats of special emphasis (e.g., big game winter range and riparian habitat).

3) Habitat with high wildlife value for many species (e.g., riparian habitat).

4) Habitat that species of sensitive, threatened or endangered status (e.g., spotted owl, or peregrine falcon) are dependent on.

(IV.A.2 Cont.1

e. Management of acquired riparian and old-growth forest sites to perpetuate existing habitat values.

f. Utilization of enhancement opportunities on public lands and other mitigation options (Section III.E) to achieve the mitigation goals of this plan, when other opportunities, for whatever reason, are not feasible.

IV.A.3 "Shopping list" approach

This plan provides the framework consisting of six major elements (Section IV.A.2) for the implementation phase. It is by necessity, general. It is impossible to be very specific regarding potential mitigation sites or projects, at this time, since it is unknown when the implementation phase will begin. Subsequently, more mitigation opportunities than necessary were identified to facilitate the implementation process when it does begin.

Under the key mitigation sites, "representative" sites were chosen to reflect what we were seeking, but it was recognized there may be obstacles to obtaining specific parcels of land. The pertinent private timber companies were contacted and various options presented to them for their consideration, including recommendation of properties to us that would meet our needs, but better dovetail with their timber management goals. This will. be pursued in more detail in the near future. In addition, on the Willamette River Greenway, although properties have been prioritized on the basis of wildlife and recreation needs, fulfillment of the riparian goal is dependent on willing sellers. These factors and many others introduce uncertainty into the plan. Therefore, the mitigation team chose to provide a long list of potential opportunities, including "out-of-kind" mitigation opportunities, to provide sufficient flexibility to meet the established goals.

The entire list of mitigation opportunities are provided in Appendix E. All of the properties and projects listed provide some degree of mitigation value to improve wildlife habitat in the Willamette Basin, have no other immediately available funding source, and fill some present "gap" in the maintenance of Oregon's wildlife resources.

IV.A.4 Plan elements: description of needs and costs

This plan presents the general methodology for the implementation phase for mitigation in the Willamette Basin. Four elements are identified to meet the needs of this plan: Advanced design, direct implementation activities, operations and maintenance activities, and monitoring activities. The first two elements activate the plan; the second two components maintain its momentum and direction. Following is a summary of anticipated activities within each plan element.

a. Advanced design

This phase is critical to the final- success of the plan because all recommendations within this plan are provisional. Implementation of the plan is scheduled over 20 years in five-year intervals, subsequently, design costs are also distributed over that time period.

Advanced design costs are broken down into those activities directly involved with land purchase and those activities pertinent to overall implementation. Costs such as identifying specific available land parcels, the time, effort and travel associated with contacting landowners, soliciting bids, and negotiations are estimated at $6 per acre, based on a biologist salary of $109 per day with 36 percent benefits and 23 percent overhead. Total design costs for the plan specific to land purchase are between approximately $170,000 and $182,000 (Table 3). Those activities such as preparing environmental assessments and management plans, preparing coordinated management agreements with other agencies, developing plans for enhancement work, evaluation of mitigation options, and assessing habitat potential, are pertinent to overall implementation. These costs are estimated at approximately $150,000 for the initial 20 years of implementation, bringing the total advanced design costs to $326,000, or approximately $11.50 per acre.

b. Implementation

The direct implementation activities include those that are necessary to initially achieve project benefits. Once the preparatory work is completed in the advanced design phase, costs and activities associated with implementation would include the following: appraisal fees, purchase costs of land or easements and associated legal costs, and initial sight development costs required. Costs of acquiring the key mitigation sites (winter range) were provided by the Forest Service and are based on 1986 costs for 1978 stand conditions. An exception was the Middle Santiam site, where estimates were based on an average of 30-year old timber. Because several of these sites have been significantly harvested since 1978, acquisition costs which more accurately reflect current stand conditions, could range approximately $2-4 million less than the $16 million in Table 2 (Section III.E.5). An additional cost of $150,000 for developing a 100-acre pasture would apply to some sites. These total costs are tentative, and specific appraisals of available properties during the advanced design phase are required.

The riparian habitat mitigation goal of over 4,400 acres not attainable on the key mitigation sites would cost approximately $6-7 million. This estimate is based on current average purchase costs of $1,500 per acre for Willamette Greenway properties. Acquisition of Greenway sites would provide the protection needed for these important riparian habitats and be consistent with Oregon's Statewide Planning Goal 15.

Implementation of the old-growth habitat mitigation goal remains a difficult problem. Even if old-growth forest similar to what was inundated was currently available, purchase costs would exceed $80 million. The mitigation team identified a limited number of old-growth 'sites not already protected (1,600 acres) and presented options for mitigating the remaining nearly 3,600 acres (Section IV.A.2).

C. Operations and Maintenance (O&M)

These activities include recurring costs necessary to maintain or continue to improve the benefits to wildlife achieved in the implementation phase. A wide range of activities fall under this category, all of which (e.g. taxes) cannot be anticipated due to the representative status of the recommended mitigation sites. It is estimated that the design of the proposed mitigation measures will involve low O&M costs. Winter range (key mitigation) sites would require maintenance of permanent pasture and perhaps some gradual conversion of hiding cover to forage areas. Cost estimates provided by ODFW habitat biologists include annual pasture maintenance of $100 per acre. Land clearing costs for other forage areas could reach $200 per acre for the first ten years under Management Plan A (Section IV.A.6.3, Tables 6 and 7). The cost of these and any other O&M expenditures on the key mitigation sites would be exceeded by revenue generated from timber harvest.

Expenses associated with riparian sites could be $20 per acre, based on Oregon State Parks estimates for existing Greenway lands and ODFW wildlife management area costs. Costs for O&M on protected old-growth sites would be minimal.

d. Monitoring

The purpose of these activities is to assess the effectiveness of the implemented mitigation measures. For the key mitigation sites, activities would include assessing shrub regeneration, forage production on pastures, and big game response to management prescriptions. 'Average costs of $.59 per acre were estimated for a biologist salary, travel, 36 percent benefits, and 23 percent overhead. These costs would principally be incurred within the first 25 years of the plan and are estimated to total approximately $147,500.

IV.A.5 Summary of mitigation plan cost estimates

The base purchase costs for the habitat goals are summarized in Table 2. Table 3 provides summarized cost estimates for all elements of the mitigation plan (i.e.,. advanced design, implementation, O&M, and monitoring).

IV.A.6 Summary of mitigation scheduling: 20-year plan

A summary of the scheduling of mitigation implementation is given in Table 4,. The plan is designed to be implemented over a span of 20 years and each five-year increment is, essentially, a mini-plan requiring facets of each of the plan components (i.e., advanced design, etc.).

This scheduling was based on a reasonable expectation of what could be accomplished on the ground for each of the habitat goals, considering all of the planning and coordination required.

Each of the habitat goals (i.e., winter range, riparian habitat and old-growth) are allocated equally at approximately 25 percent of the overall goal, within each of the five-year schedule groups. This is simplistic in that it is not known what opportunities will be available.

IV.A.7. Maximizing mitigation dollars: Opportunities

Some innovative possibilities exist under this proposed mitigation plan, which include: Cost-sharing, eventual generation of operation and maintenance (O&M) monies on the key mitigation sites, and subsequent advantages of a trust fund concept.

a. Cost sharing

One of the ways to make mitigation dollars go as far as possible is to share the cost of initial property purchase or O&M with a private organization, or public entity where mutual benefits can be obtained. Such a case is illustrated by the Mary's River parcel (Appendix E) possessing both mature forest attributes as well as unique habitat characteristics sought by the Oregon Chapter of The Nature Conservancy.

Another possibility for cost-sharing has been identified along the Willamette River Greenway where mutual goals of this mitigation plan and Oregon State Parks can be met.

b. Eventual revenue production on the key-mitigation sites

As identified in Table 7 (Section IV.A.8), the potential exists for the generation of sufficient monies to pay the cost of future O&M on these sites, while at the same time retaining 30 percent of the land base in old growth and maximizing elk production.

C. Trust fund concept

Since the potential to generate funds on the key mitigation sites exists, some sort of trust fund should be developed to handle the revenue, perhaps along the lines of the USFS "K-V" funds (Section V.D), whereby the money could be directed to the area of immediate O&M needs. Eventually, such a fund might provide wildlife habitat development funds beyond the scope of this plan in other parts of the state.

Table 3. SUMMARY OF MITIGATION PLAN COST ESTIMATES OVER 100 YEARS

cost Item	Winter range[a] goal	Riparian goal[b]	Old Growth Goal[c] Option 1	Option 2	Option 3
Acquisition	144,000	6,600,000	80,000,000	4,000,000 (average)	
Development[d]	1,200,000	250,200	--	--	(all costs included)
Advanced Design:					
1. $6 per acre land purchase	120,000	26,400	23,736	35,604	--
2. Other design costs (total for all categories)	150,000				
TOTAL INITIAL COSTS	17,614,000	6,876,600	80,023,736	47,035,604	20,000,000
O&M[e] (for 20 years)	1,670,000	unknown	--	--	--
Monitoring[f]	147,500	--	--	--	
TOTAL COSTS	19,431,500	6,876,000	80,023,736	47,035,604	20,000,000

TOTAL PLAN COSTS

Winter Range Goal + Riparian Goal = 26,307,500 = Old-growth goal

Option 1: $106,331,336
Option 2: $ 73943,104
Option 3: $ 46,307,500

a Purchase estimates for key mitigation sites based on 1978 stand conditions and 1986 costs. Final costs could be less.

b Average 1986 purchase value of $1,500 per acre for balance of riparian goal (approximately 4,400 acres).

c Option 1 = purchase 3,956 acres of true old-growth: option 2 = purchase 5,934 acres of 40-year-old second growth; option 3 = dedicate $20 million to maximize mitigation opportunities. Purchase costs include minimum appraisal fees of $5,000 per 1000-acre parcel and minimum land costs of $300 per acre.

d Based on 800 acres of pasture development, at $1,500 per acre, on key mitigation sites (Table 7). Riparian costs are based on $50 per acre for 5,004 acres (total acreage goal). Old-growth development costs are considered minimal.

e O&M essentially consists of 2 facets (Table 7): 1) maintenance of a total of 800 acres of permanent pasture at $100 per acre per year (i.e., $80.000). or $8 million over 100 years: and 2) maintenance of approximately 7,500 total acres of forage (i.e., shrub/grass) areas at a cost of about $40 per acre per approximate five year intervals, or $6 million over 100 years. Based on this, annual O&M costs are approximately $140,000, but do not reach that level until year 25 of plan (Table 4). Over the life of the mitigation, plan, O&M costs are exceeded by timber revenues (Table 7). Therefore, only costs incurred during the 20-year implementation phase (Table 4) are included in'total costs. Supplementation of timber revenues lost to counties, in the short-term, will have to be worked out and included as part of O&M costs. Average O&M costs for riparian areas is $20 per acre on an "as needed" basis. Because the goal is 4,400 prime habitat areas, O&M costs should be minimal, but are unknown.

f Based on SO.59 per acre for winter range to determine, for example, success of treatment schedule in terms of elk use. Total monitoring costs, limited largely to the first 25 years would be approximately $147,500 (Table 4).

Table 4. TIME SCHEDULE AND COSTS FOR IMPLEMENTATION OF MITIGATION PLAN

Year		5-Year Costs[a]
1) 0-5		
Purchase 5,000 acres of winter range		$ 4,036,000
Purchase 1,100 acres of Greenway sites, other costs		$ 1,650,000
Implement 1/4 of old-growth planl:		
	Option 1:	$20,000,000
	Option 2:	$11,750,000
	Option 3:	$ 5,000,000
Other costs over 5 years		
Advanced design		$ 81,500
Development[b] (winter range/riparian)		$ 362,550
Operations and Maintenance (i.e., 200 acres of pasture; 1,875 acres of forage on winter range)		$ 175,000
Monitoring[c]		

Total 5-year costs including old-growth		Average Annual Costs including old-growth	
Option 1:	$26,305,050	Option 1:	$ 5,261,010
Option 2:	$18,055,050	Option 2:	$ 3,611,010
Option 3:	$11,305,000	Option 3:	$ 2,261,010

2) 6-10		
Purchase 5,000 acres of winter range		$ 4,036,000
Purchase 1,100 acres of Greenway sites		$ 1,650,000
Implement 1/4 of old-growth plan:		
	Option 1:	$20,000,000
	Option 2:	$11,750,000
	Option 3:	$ 5,000,000
Other costs over 5 years		
Advanced design		$ 81,500
Development (winter range/riaprian)		$ 362,550
Operations and Maintenance (i.e., 400 acres of pasture; 3,750 acres of forage areas)		$ 350,000
Monitoring (based on acreage of winter range purchased, first 5 year interval, i.e., 5,000 acres)		$ 14,750

Total 5-year costs		Averaae Annual Costs	
Option 1:	$26,494,800	Option 1:	$ 5,298,960
Option 2:	$18,244,800	Option 2:	$ 3,648,960
Option 3:	$11,494,800	Option 3:	$ 2,298,960

3) Year 11-15

Purchase 5,000 acres of winter range		$ 4,036,000
Purchase 1,100 acres of riparian		1,650,000
Implement 1/4 of old-growth plan:		
	Option 1:	$20,000,000
	Option 2:	11,750,000
	Option 3:	5,000,000

Other costs over 5 years

Advanced -design	$ 81,500
Development	$ 362,550
Operations and Maintenance (i.e., 600 acres of pasture; 5,625 acres of forage)	$ 525,000
Monitoring (i.e., 10,000 acres)	$ 29,500

Total 5-year costs		Average Annual Costs	
Option 1:	$26,684,550	Option 1:	$ 5,336,910
Option 2:	$18,434,550	Option 2:	$ 9,217,275
Option 3:	$11,684,550	Option 3:	$ 2,336,910

4) 16-20

Purchase 5,000 acres of winter range		$ 4,036,000
Purchase 1,100 acres of riparian		$ 1,650,000
Implement 1/4 of old-growth plan:		
	Option 1:	$20,000,000
	Option 2:	$11,750,000
	Option 3:	$ 5,000,000

Other costs over 5 years

Advanced design	$ 81,500
Development[b] (winter range/riaprian)	$ 362,550
Operations and Maintenance (i.e., 800 acres pasture; 7,500 acres of forage)	$ 620,000
Monitoring (i.e., 15,000 acres)	$ 44,250

Total 5-year costs		Average Annual Costs	
Option 1:	$26,794,300	Option 1:	$ 5,358,860
Option 2:	$18,544,300	Option 2:	$ 3,708,860
Option 3:	$11,794,300	Option 3:	$ 2,358,860

APPROXIMATE TOTAL COSTS FOR 20-YEAR[d] SCHEDULE:

Plan with option 1: $106,000,000
Plan with option 2: $ 73,000,000
Plan with option 3: $ 46,000,000

(Table 4, Cont.)

a Advanced design costs directly associated with land purchase is an. average of $176,000 for all three habitat categories (i.e., $44,000 per five-year interval over the first 20 years); supplemental design costs including analysis of mitigation sites, development of management plans, environmental assessments, etc., is a total of $150,000 (i.e., $37,500 per five-year interval over the first 20 years).

b O&M costs would increase as more land is purchased.

c Determined at $.59 per acre per year; not required during the first five year interval. Monitoring costs would increase over the first 25 years of the plan, reaching a maximum annual cost of $11,800. Monitoring costs would be expected to decrease rapidly after 25 years.

d After 20 years, the mitigation plan may be self-perpetuating, utilizing timber revenues to maintain it.

IV.A.8 Generic Plan for development of Roosevelt elk winter range

This generic management plan for big game is intended to apply to a range of existing habitat conditions and management options. It will be adapted to specific sites as they are identified during the advanced design phase (Section IV.A.4). The three management options were developed from ODFW cover criteria for elk (ODFW, 1985), wildlife biologists familiar with habitat requirements of Cascade Range elk, Willamette National Forest personnel, and recommendations in Brown (1985) and Harshman and Jubber (Unpub. report by E. Harshman and R. Jubber, see Appendix G). Management prescriptions and cost estimates are based on a 100-year management plan.

Study Area

For purposes of this example, a management area of 2,000 acres (3 miles by approximately 1 mile) was used, which borders a stream on one side. Two site conditions were selected to illustrate the application of each management option. These site conditions were based on the key mitigation sites evaluated during the development of this plan (Table 2). Site conditions #1 was defined using LANDSAT Satellite imagery, and condition #2 represented conditions existing on selected private forest lands.. They are as follows:

a) Site Condition #1: Forage, 20 percent (400 acres); hiding cover 20 percent (400 acres); thermal cover (age 35), 50 percent (1,000 acres); optimal cover, 10 percent (200 acres).

b) Site Condition #2: Forage, 100 percent (all acres clear-cut within the last 10 years); all trees 10 years old or less.

Objective

To provide stable, high quality elk winter range, while maximizing benefits to other target species. A secondary objective under the plans is to explore the.potential to derive timber revenue where compatible with wildlife objectives, to make the entire mitigation plan self-sustaining over the long-term.

Habitat Management

All management options include dedicating 600 acres to old-growth forest (exempt from harvest) and 100 acres to improved pasture. A minimum 1/8 mile-wide buffer (240 acres) along the stream, and an additional 360 acres within the unit will comprise the old-growth forest requirement. Existing stand conditions will be given credit as "functional" 01 d-growth according to the weighting procedure in Table 5. The remaining 1,300 acres will be subjected to the treatments specified in Plans A, B and C and summarized in Table 6.

Table 5. Calculation of "functional" old-growth habitat objective.

Acres	Present Age	Functional Years In Mitigation Plan[a]	Old-Growth Value (Weight)	Weighted Acreage
1.00	90	100	1.0	100
	80	90	.9	90
	70	80	.8	80
	60	70	.7	70
	50	60	.6	60
	40	50	.5	50
	30	40	.4	40
	20	30	.3	30
	10	20	.2	20
	0	10	.1	10

[a]Represents the number of years in this 100-year plan that trees are 90 years or older - the age at which optimal thermal cover characteristics are evident.

Plan A - Manage 1,300 acres on a 60:40 forage:cover ratio

1) Site Condition #1

a) Forage areas (780 acres) will be allowed to regenerate naturally and will be maintained in a shrub (e.g., Ceanothus spp) condition to provide winter browse. Treatments required to provide the forage acreage are:

Convert 80 acres of thermal cover to forage, convert 400 acres of hiding cover to forage, and maintain 300 acres of forage in a forage condition (Table 6).

Because of the timber value already accrued in the thermal cover stands, logging will be delayed 10 years for trees to reach a more marketable site (12 inches dbh). Net revenue gain of $158,640 could be used to defray other long-term costs.

The 400 acres of hiding cover will be converted to forage areas at the rate of 40 acres per year over 10 years. The costs associated with this conversion average $200 per acre, for an annual cost of 88,000 and a total cost of $80,000 for 10 years.

Existing forage areas (300 acres) will be managed to encourage shrub growth and limit conifers at an average cost of $40 per acre. Costs could be about $12,000 every five years. The management of forage areas will be assessed in terms of animal response and successional change.

Table 6. Summary of management opt ions for elk winter range on representative 2,000-acre mitigation sites.

Site Condition 1 (Age)	PLAN A Acres AC.	Dedicated Old-growth	Pasture	Maintain 60:40 forsge :cover ratio	PLAN B Dedicated Old-growth	Pasture	Manage on 200 year rot at ion	PLAN C Dedicated Old-growth	Pasture	Manage on 200-year and . 100-year rotation
Forage (5)	400		100	Maintain 300 ac as forage		100	Maintain 130 ac as Forage. Enhance 170 ac For coyer		100	Manage 800 ac on a 200-year rotation and 500 ac on a 100-year rot at ion
Hiding (15)	400			Convert 400 ac to Forage			Enhance 400 ac For cover			
Thermal(35)	1,000	400		Retain 520 ac as cover; convert 80 ac to Forage	400		Enhance 600 ac For cover	400		
Optimal (90+)	200	200			200			200		
TOTAL	2,000	600	100	1,300	600	100	1,300	600	100	1,300
Site Condition 2										
Forage	2,000	600	too	Maintain 1,300 ac in a 60:40 Forage: cover ret io	600	100	Manage 1,300 sc on a 200-year rot at ion	600	100	Manage 800 ac on a 200-year rotation and 500 ac on a 100-year rotation
TOTAL	2,000	600	100	1,300	600	100	1,300	600	100	1,300

Costs associated with developing a 100-acre permanent pasture can be as high as $1,500 per acre, depending on topography and vegetation on the site, for a total of $150,000. Annual maintenance costs are $100 per acre, or $10,000 per year. The maintenance of 100 acres of pasture over 100 years is $1 million.

b) Cover areas will be provided by retaining 520 acres of existing thermal cover. To encourage the growth of an understory layer characteristic of optimal thermal cover, commercial thinnings at ages 47 and 67 will be heavier than under a normal system of timber rotation.

At age 47, the net gain after logging costs is $441 per acre for a total gain of $229,320. At age 67, the net gain is $1,905 per acre for a total revenue gain of $990,600.

Projected costs and revenue gains over 100 years indicate timber revenue would pay for maintenance costs and return a net gain of $136,560, not including purchase (Table 7). Representative purchase costs are provided in Table 8.

2) Site Condition #2

a) Forage areas will be maintained on 780 acres by limiting the growth of existing conifers. Costs at $40 per acre would be approximately $31,200 every five years.

Costs of developing and maintaining a permanent pasture are the same as under Site Condition #1, and total $1,150,000 over 100 years.

b) Cover requirements will be provided on 520 acres fertilized to enhance development of an understory layer. Fertilizer will be applied at age 30 at the rate of 200 pounds per acre. Costs are $75 per acre for a total of $39,000.

Commercial thinning at age 47 will yield a net revenue gain of $229,320; another commercial thinning at age 67 will return $990,600.

Over the span of 100 years, projected maintenance costs would exceed revenue gains by $280 (Table 7).

Plan B - Manage 1,300 acres on a 200-year rotation, which would provide ratios of 10 percent forage (130 acres);' 15 percent hiding cover (195 acres); 25 percent thermal cover (325 acres); and 50 percent optimal thermal cover (650 acres). This rotation calls for harvesting 0.05 percent of the area per year (6.5 acres). Maintenance of 600 acres dedicated to old-growth and the cost of developing and maintaining 100 acres of permanent pasture remains the same.

Table 7. Cost summary for management options of elk winter range on representative sites, over 100 years.

Treatment	PLAN A		PLAN B		PLAN C	
	Site Condition 1	Site Condition 2	Site Condition 1	Site Condition 2	Site Condition 1	Site Condition 2
1. Purchase[a]	$3,502,000	$1,151,000	$3,502,000	$1,151,000	$3,502,000	$1,151,000
2. Develop 100-acre pasture	150,000	150,000	150,000	150,000	150,000	150,000
Maintain pasture	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
3. Maintain forage areas	12,000	31,200	5,200	5,200	7,200	7,200
4. Convert hiding cover to forage (over 10 years)	80,000					
5. Convert thermal cover to forage	+158,640					
6. Forage seed and fertilize clearcuts					5,100	1,700
7. Fertilize stands (@30 yrs)		39,000	50,250	87,750	39,000	84,000
8. Commercial thin (47)	+229,320	+229,320	+515,970	+824,670	+415,920	+317,520
9. Commercial thin (67)	+990,600	+990,600	+2,228,850	+3,562,350	+1,740,400	+1,740,000
10. Clearcut					+1,041,600	+347,200
11. Net total (development and O&M only)	+$136,560	-$280	+$1,539,370	+$3,144,070	+$1,996,620	+$1,161,820
12. Net total (purchase included)	$3,365,440	$1,151,280	$1,962,630	$1,993,070	$1,505,380	$ 10,820

a See Table 8.
b + indicates net revenue gain.

Table 8. Acquisition costs for a representative key mitigation site of 2,000 acres.

Site Conditiona	Age	ACRES Site Cond. 1	ACRES Site Cond. 2	Cost per Acre	COSTS Site Cond. 1	COSTS Site Cond. 2
Forage	5	400	2,000	$ 575	$ 230,000	$1,150,000
Hiding	15	400		$ 720	288,000	
Thermal	35	1,000		$1,500[b]	1,500,000	
Optimal[c]		200		$ 7,400	1,480,000	
Title insurance, escrow, recording fees					1,000	1,000
Timber Cruise					3,000	
TOTAL					$3,502,000	$1,151,000

a See page 51 for site condition information.
b Approximate extrapolation
c Based on volume of 60,000 board feet per acre.

1) Site Condition #1

a) Forage areas would be maintained by limiting the growth of conifers on the 130 acres currently in the forage condition. Costs are $40 per acre, for a total of $5,200. These areas would require maintenance as forage until the oldest trees are scheduled for harvest. The oldest trees, not dedicated to old-growth, are approximately 35 years old and will not reach harvest age under this plan for 165 years. At this time, succession will have provided stand conditions in the approximate ratio that would occur under a 200-year rotation. The prescriptions of the 200-year rotation scheme would then be implemented. .

b) Cover prescriptions required within 100 years to bring existing timber stands into a 200-year rotation ratio include the following:

1. Fertilize the remaining 270 acres currently in forage, for maximum tree growth (minimal cost, $20,250) and commercial thin at age 47 (revenue, $74,970) and age 67 (revenue, $323,850).

   Net revenue gain approximately $378,570.

2. Fertilize 400 acres of hiding cover at age 30 (minimum cost, $30,000) and commercially thin at age 47 (revenue, $176,400) and age 67 (revenue, $762,000).

   Net revenue gain, approximately $908,400.

3. Commercially thin 600 acres of thermal cover at age 47 (revenue, $264,600) and age 67 (revenue, $1,143,000).

   Net revenue gain approximately $1,407,600.

Accounting for 100 years of pasture development and maintenance and the above costs and revenues, this management would yield a net gain of $1,539,370, not including initial purchase (Table 7).

2) Site Condition #2

a) Forage areas (130 acres) would receive the same treatment described under site condition #1 at a cost of $5,200. Because the oldest trees are only five years old, maintenance as forage would be required for 195 years prior to initiation of the 200-year rotation plan.

b) Cover prescriptions for the remaining 1,170 acres would involve fertilizing for maximum tree growth (a minimum cost of $87,750), commercial thinning at age 47 (gain = $824,670) and age 67 (gain = $3,562,350).

With all costs and revenues, except land purchase, this plan would yield a net revenue gain of $3,144,070 (Table 7).

Plan C Manage 800 acres on a 200-year rotation (80 acres forage; 120 acres hiding cover; 200 acres thermal cover; 400 acres optimal thermal cover), and 500 acres on a 100-year rotation. The 100-year rotation harvests 1 percent of the area per year and provides a ratio of 20 percent forage (100 acres); 30 percent hiding cover (150 acres); and 50 percent thermal cover (250 acres).

1) Site condition #1

a) Forage areas will be maintained on 80 acres under the 200-year rotation for a cost of $3,200, and 100 acres under the 100-year rotation for a cost of $4,000, until forage:cover ratios approximate actual conditions in a managed forest.

b) Cover prescriptions would involve fertilizing 120 acres of hiding cover, and commercial thinning 720 acres of hiding and thermal cover at ages 47 and 67 under the 200-year rotation (net gain for all activities, $1,680,120).

Using the 100-year rotation, commercial thinning volumes are less than under an extended rotation. The thinning at age 47 is approximately 17 percent less volume, and at age 67 about 38 percent less. These differences were used in the following calculations: A total of 400 acres of forage and hiding cover will be fertilized at age 30 at a cost of $30,000, and thinned at age 47 at a gain of $98,400.

Another thinning at age 67 would yield $368,800 in revenues, and final harvest gains are $17,360 per acre. Because the oldest trees entered into the 100-year rotation are 15 years old, final harvests will not begin for 85 years. At this time, clear-cutting four acres (1 percent) per year would include 60 acres within the 100-year management plan and return a revenue gain of $1,041,600. Clearcut units will be seeded with big game forage and fertilized (costs for 60 acres @ $85 per acre, $5,100).

This management would provide a net gain of $1,996,620 (Table 7).

2) Site condition #2.

a) Forage areas will be maintained on 80 acres under the 200-year rotation and 100 acres under the 100-year rotation for a total cost of $7,200.

b) Cover treatments under the 200-year rotation system will involve fertilizing and two commercial thinnings on 720 acres for a net revenue gain of $1,635,120. Prescriptions for the 100-year rotation are fertilizing, and two lower volume thinnings on 400 acres, for a net revenue gain of $437,200. Final harvest would begin on four acres per year beginning in year 95 of the 100-year management plan. Net revenue gain for five years would be $347,000. Clearcut units would be seeded with big game forage and fertilized at a cost of approximately $1,700.

This management option would provide $1,161,820 in revenue (Table 7).

Other Factors

Other factors that would have to be considered when applying a generic big game management plan to specific properties include the following:

1) Slope, aspect, soil, elevation.

2) Access.

3) Size of mitigation area.

4) Potential for a coordinated management plan with FS, BLM, etc.

5) Long-term management intent on surrounding land.

6) Presence or absence of riparian area, other body of water, SOMA/SOHA, endangered species, etc.

7) Existing timber structure on the mitigation site.

8) Desirability of permanent pasture.

9) Excessive roading on proposed site or in surrounding areas.

Guidelines for developing specific big game management plans in the Cascades are available in Brown (1985). A Memorandum of Understanding between ODFW and USFS, signed in 1979, promotes the utilization of guidelines provided in Thomas (1979), for both fish and wildlife habitat protection planning. Brown's publication is a sequel to that of Thomas. Considerable additional information is available, including an elk habitat model for western Oregon (USFS, 1986) and elk and deer guidelines in the Cascades (Unpub. report by E. Harshman and R. Jubber).

IV. B Other Mitigation Alternatives Considered

The preferred alternative, based on 100 percent replacement of the structural components of the lost habitat, takes into consideration the inherent value of the total habitat and its value to many different wildlife species. At the same time, it recognizes realistic constraints resulting from an attempt to mitigate for historic losses, and accepts immediate shortfalls in habitat value, in exchange for long-term benefit. The preferred alternative has a strong biological basis and retains sufficient flexibility to address a wide range of opportunities and concerns in the implementation phase of this program. A number of other alternatives were considered which, under specific circumstances; could be developed into viable mitigation plans. However, under the constraints that currently limit the availability of mitigation opportunities within the Willamette River Basin, the preferred alternative, as outlined in Section IV.A, was determined to be the most feasible. The other alternatives and their principle shortcomings are succinctly described in the following sub-sections.

IV.B.1 Full redress, achieved by replacing all habitat units lost for all evaluation species.

This alternative would seek mitigation through the'traditional concept of habitat improvement and would not credit the exchange of immediate habitat value (e.g., functional old-growth concept) for long-term protection, or the acre-for-acre exchange (e.g., riparian habitat) for the protection of valuable existing habitat.

Although this alternative would provide more benefits to wildlife than the preferred alternative, it is considered an ideal that is not realistically achievable. It differs from the preferred alternative both in scope (i.e., much more land would be required for mitigation under full redress) and refusal to accept, "shortfalls" in mitigation objectives in exchange for protection of existing and future habitat values.

This alternative is not flexible enough to deal with the many difficulties encountered in mitigating for historic habitat and would be considerably more expensive than the most expensive option under the preferred alternative (Option 1).

IV.B.2 Fulfill all habitat goals on key mitigation sites.

This alternative maintains the structural replacement concept, but limits mitigation to the mitigation sites in proximity to the project areas. This eliminates going off-site for riparian habitat and old-growth objectives, or seeking other mitigation opportunities. Mitigation would be pursued by purchasing key mitigation sites until the 25 percent riparian and 26 percent old-growth structural replacement goals are reached. Considering that 20,000 representative mitigation acres provides only three percent of the riparian and six percent of the old-growth structural goals, up to eight-times as much land acquisition would be required under this alternative.

This alternative, like IV.B.l, is not flexible enough, and the land acquisition and total cost is prohibitive. In addition, all of the old-growth values would be only functional, providing minimal old-growth habitat at the end of the mitigation plan time-frame.

IV.B.3 Emphasis on single-species mitigation.'

This alternative would seek 100 percent (i.e., 15,295 HU's) mitigation for elk losses and would ignore the critical importance of the other structural components to other wildlife. This concept recognizes that the total 20,123 acres was evaluated as critical big game winter range. On the basis of an average habitat rating of 0.4 for the representative key mitigation sites, the quantity of land needed to replace the total habitat unit value for elk would be approximately 40,000 acres of cut-over timber lands.

This alternative was rejected because of its narrow mitigation potential. As discussed -in Section III.D, these key mitigation sites will, in the long-term, provide good quality elk winter range for all but the harshest winters. However, they can never possess "the habitat quality for other wildlife species the preconstruction complex of lowland, old-growth and riparian habitat had." This alternative is not cost-effective in terms of providing the best mitigation for the cost, and it was the consensus of the Mitigation Team that they did not want to ignore other wildlife values. This alternative differs principally from the preferred alternative in terms of approaching mitigation as replacement of critical big game winter range only, rather than as replacement of habitat with separate structural components; all of which have distinct wildlife values.

IV.B.4 Fulfill all habitat goals by enhancement activities (i.e., habitat improvement) on lands currently in public ownership.

Considerations pertinent to the rejection of this alternative as a total program direction are discussed in Section V.C.

The preferred alternative does not preclude enhancement opportunities on public lands if they can be shown to be productive habitat measures, merit funding under this program, and are compatible with the overall direction of this mitigation plan. At this time, few opportunities have been identified (Appendix E).

IV.B.5 Trade documented habitat value losses for current management needs within the state.

This alternative as a total program direction was rejected on the basis of a.limitation imposed by the Regional Power Act, which addresses fish and wildlife species "affected by" hydroelectric development, operation and management (Section 4.(h)(5).

The preferred alternative, however, does address management needs for the evaluation species, coordinating management needs and mitigation goals-when possible. In addition, due to current habitat limitations, the preferred alternative gives mitigation credit for the protection of existing and future habitat values on the basis of present wildlife management needs. Current management needs and habitat availability cannot be ignored when mitigating for historic losses.

IV.B.6 No action

This alternative would maintain the status quo initiated at the time of construction for all eight projects of not mitigating for impacts to wildlife. This is clearly not the intent of the Power Act.

V. DISCUSSION AND SUMMARY

V.A Introduction

This mitigation plan was developed with the intent of mitigating to the greatest extent possible, with the resources available, for negative impacts to wildlife resulting from the specified hydroelectric projects. Based on the hydroelectric benefits gained through development and operation of the project (Appendix B), we conclude that the hydropower mitigation responsibility is 70 to 93 percent of the total operation of the projects. Considering the magnitude of wildlife habitat loss, we recognize that under the most optimistic scenario it is possible to mitigate for only a portion of what was lost. In current dollar-values, the cost of fully mitigating the loss would exceed $200 million. Because of this, the preferred alternative accepts certain biologically justified shortfalls in meeting the plan objectives.

We have attempted to take as realistic and balanced a view as possible in the development of this plan, taking into consideration the documented losses, the needs of the affected wildlife species, and current habitat and management needs within the state. Relative to other hydro-sites within the Columbia River Basin, we are faced with a consideration that is unique to the Willamette Basin: the high cost of doing business in some of the most productive coniferous forest lands in the world. The land base in western Oregon and Washington is used predominantly for the production of wood products. Wildlife habitat management on public land in this highly productive timber area, is carried out in coordination with timber management (Brown, 1985). The predominant timber management system on both public and private lands in the Willamette Basin, is even-aged trees produced by clearcutting large land parcels (Brown, 1985). In general, wildlife need a variety of habitats to meet their year-round survival needs; and they need the same proportion of variety on a permanent basis. The even-aged structure, when applied to a large segment of the land base, has limited usefulness to wildlife because it tends to meet only partial wildlife needs, such as forage or hiding cover, for short periods of time. Some sacrifice in harvest revenues is required to provide good wildlife management on forested lands, in terms of the level of sustained diversity necessary for the long-term survival of a diverse fauna.

This cost of providing for wildlife needs is high in the Willamette Basin, and will become higher as the demand for forest products increases and the available productive timber acreage decreases due to human development and population expansion. The provisions of the Regional Power Act offer a unique opportunity to offset some of the past, present and future negative trends to wildlife. Providing adequate mitigation for hydroelectric impacts in the Willamette Basin is going to be relatively more expensive than comparable mitigation in other parts of the Columbia River Basin, because of the nature of the land base.

V.A.l. Structural Replacement Goal

Wildlife depend on sustained habitat diversity to meet their survival needs. Thomas et al. (1979) report that "wildlife respond to the structure of a forest perhaps more than to any other single factor." Brinson et al. (1981) further identify the major components of diversity in habitat types as: 1) edge (i.e., interface zones); 2) variable vertical structure (i.e., layers of vegetative growth); and, 3) variable horizontal structure (i.e., "patchiness"). Because of this ultimate importance to wildlife, the overall goal of this mitigation plan is the replacement of the preconstruction habitat community structure (i.e., winter range, riparian habitat and old-growth forest).

V.A.2 Importance of the big game winter range goal'

As mentioned throughout this report, big game populations sustained major losses in critical winter range as a result of construction of the Willamette projects. Because winter range has been identified by resource agency biologists as the limiting factor for Roosevelt elk populations in the Cascade Mountains, proper management of existing range is essential in meeting winter habitat requirements.

The basic needs of Roosevelt elk for food and cover can be provided on winter range by the proper scheduling and size of forage areas (e.g., clearcuts) and maintenance of adequate cover. Long-term management of a specific forage to cover ratio is required to provide a stable elk population. Snow depths exceeding 18 inches tend to bury most forage and 'impede the movement of elk. Elk depend on optimal cover, characteristics provided by large sawtimber or old-growth stand conditions, to survive adverse weather conditions. This optimal cover provides thermal protection, and the snow-intercept capability inherent within these stands of larger trees reduces snow depths. The shrub and herbaceous layers, lichens, and litterfall found within these less exposed areas, provide a supplemental forage critical to ungulate survival during prolonged periods of adverse weather conditions. Observations by Harshman and Jubber (Unpub.) indicate elk select optimal cover on floodplains during inclement weather and experience higher survival there than in areas without optimal cover.

Optimal cover stands in western Oregon are rapidly being eliminated as commercial forest management intensifies (Brown et al. 1985). On private lands, current timber harvest practices involve liquidating old-growth timber and utilizing harvest rotations of between 50 and 90 years. This tends to create large clearcut areas, resulting in extremely poor cover:forage ratios. Depending upon snow conditions and the proximity of adequate cover, elk populations may initially increase in response to the additional forage acreage. These areas, however, quickly grow into a stage of limited forage production and the resulting decline in elk numbers is indicative of a "boom and bust" population cycle. This situation occurs' because the forage and cover required to support a stable elk population is not sustained over time (Brown et al. 1985).

This mitigation plan focuses on acquisition of winter range on private land in the project areas because of the need to upgrade the overall habitat management to prevent this undesirable cycle of unstable elk populations. Current Roosevelt elk population estimates for the Willamette National Forest are at least 1,500 animals less than the benchmark numbers proposed by ODFW. According to a procedure developed by Harshman and Jubber (Unpub.), production of 1,500 elk would require nearly 34,000 acres of managed forest land (Appendix G). Our winter range proposal of approximately 20,000 acres of lower cost, cut-over land could eventually provide an estimated 60 percent of the benchmark numbers based on this method of estimating elk production. We feel these numbers and probably more, could result from managing the proposed mitigation lands with emphasis on elk (e.g., forage production could be increased at the expense of timber production).

V.A.3 Importance of the riparian and old-growth forest goals

Recognition of the importance of riparian and old-growth forest habitats by the Mitigation Team is reflected in the significant portion of this mitigation plan allocated to these habitat types. Because the vegetation and structural diversity, presence of water, and other characteristics of riparian areas provide a wide range of habitat opportunities, these areas are extremely valuable to many species of wildlife. In addition to the many species directly dependent on these areas, others use them as preferred seasonal habitat or as travel corridors. Riparian habitat is regularly used by 39 percent of the nongame birds and 50 percent of the nongame mamnals native to Oregon, and supports more species than any other community type (Marshall, 1986).

Heightened public awareness of the value of riparian habitat and associated wildlife species is illustrated by the recent passage of state legislation designed to protect these areas. The 'Riparian Tax Incentive Law of 1981 provides tax exemption for Oregon landowners dedicating riparian areas to special protection. This protection is provided under management plans developed with ODFW agreement and pursuant to acknowledged county land-use plans. The Oregon Forest Practices Act contains provisions for protecting riparian habitat, as do several federal laws governing management of public lands (Appendix D). Old-growth forests in the Pacific Northwest provide optimum habitat for as many as 18 bird and mammal species (Meslow et al. 1981).

Recognition of the wildlife implications of the recent intensive old-growth forest harvest has only occurred since the early 1970's. Preservation of old-growth habitat and the wildlife species dependent on it has become an important issue, as evidenced by the USFS preparation of a supplemental Environmental Impact Statement on spotted owl habitat management guidelines.

Recently, a significant increase in the nonconsumptive use of wildlife beyond the traditional consumptive use, has been recognized. In 1980, an estimated $140 million was spent on nonconsumptive wildlife recreation by Oregon residents and an unknown amount was spent by nonresidents (ODFW, 1986). A federal nongame law, the Fish and Wildlife Conservation Act, was passed in 1980 to provide assistance to states for

nongame wildlife plans and programs. In 1979, the Oregon Legislature passed House Bill 2536 initiating the first income tax check-off, which generated an average of $275,000 per year for nongame wildlife between 1979 and 1984 (Marshall, 1986). In addition, hunters spent approximately $148 million in Oregon in 1980.

Beyond their inherent value to wildlife species, the importance of riparian areas and old-growth forests is emphasized by their diminishing supply and competing land uses; both of which threaten their availability to wildlife. Timber production, livestock-use, road construction, rock and gravel excavation, mining, and recreation all directly impact these areas and often degrade or eliminate wildlife values. Old-growth forests are being liquidated at a rapid rate on public and private land in the Pacific Northwest (Meslow et al. 1981). The annual harvest of Douglas fir sawtimber from western Oregon and western Washington over the last 30 years has averaged three times the annual growth (Harris et al. 1982). Large acreages of young and middle-aged timber stands characteristic of current forest management practices do not meet the habitat needs for the range of species associated with older forests.

V.B Justification for Land Purchase as a Major Program Direction

The Interagency Mitigation Planning Team considered all possible mitigation optibns as ways to meet the identified mitigation goals (Section III.E). The final recommendation, however, is primarily the purchase of private lands. Other options are recommended when it is clearly indicated a significant habitat gain can be achieved from an enhancement activity that has no alternative funding source. This direction evolved during the planning period as a result of evaluating both the cost-effectiveness and biological-effectiveness of the various mitigation options. Following are findings that supported the private purchase options:

1. In general, habitat values on public lands are in better condition than equivalent habitats on private lands. In many instances the difference is dramatic (e.g., the trend on private timber lands to remove more riparian vegetation and produce larger clearcut areas in their timber harvests, than are legally allowed on public lands).

2. The wildlife values for all three habitat categories (i.e., winter range, riparian and old-growth forest) are threatened by human activities and development throughout the Willamette Basin. Habitat protection is needed in all cases.

3. There is little incentive to manage for wildlife on private lands because of the resulting reduction in timber revenues (e.g., board-feet left standing, increased harvest costs, costs of preventing public access to road systems, etc.)

4. Wildlife management on the federally-owned lands in the Willamette Basin could be improved in certain instances, but is relatively good overall, particularly as compared with adjacent private lands.

Environmental laws govern USFS and BLM actions on their lands, and funding sources are available for wildlife management (see number 8 below).

5. Considering the overall higher habitat value existing on USFS lands, there is a relatively low net gain in habitat value from enhancement activities. The large amounts of federal land needed to mitigate for even a small portion of the documented losses is not feasible under present management of the national forests.

6. The greatest gains in mitigation values on public forest lands would probably be made in -harvest rotation deferrals. However, since a national forest has timber production goals, a deferral of 30 or 40 years in one area may result in an increased harvest in another area. If this occurred, there would not be a true mitigation gain.

7. The Willamette National Forest draft management plan has not yet been completed, and therefore, a comprehensive list of wildlife enhancement opportunities is not available. As the forest plan develops, more coordinated opportunities for enhancement may become apparent.

8. The USFS has several sources of funding available for wildlife enhancement activities, including: "P&M" funds (i.e., Program Management funds from Congress) and "K-V" funds (i.e., monies appropriated by the Knutson-Vandenberg Act of 1930 from timber sales on public lands for reforestation, wildlife enhancement, etc.). Although there are some restrictions on how "K-V" funds may be spent (i.e., on a specific timber sale), the Willamette National Forest, due to its high, productivity, generates some of the highest levels of K-V funds in the nation. The P&M funds tend to be more erratic, but the National Forest System received its largest wildlife budget ever, more than $40 million, in 1987; and BLM received more than $16 million (Wildl. Managemt. Inst., 1986). The P&M fund allocation from Congress must be divided among all the nation's forests, nineteen of which are included in Region 6, and is not exclusively dedicated to enhancement activities. At this time, enhancement activities beyond the scope of these funding sources have not been clearly identified on the Willamette (e.g., forage seeding of the Hills Creek drawdown zone (II.B.3; Appendix E) appears to be the only wildlife project submitted in 1987 for P&M funding on the Willamette National Forest). (Personal comm., USFS Region 6, Headquarters Office, Portland, January 6, 3.987). As indicated in number 7 above, enhancement opportunities outside the scope of these funding sources probably exist, and should be considered for incorporation into the Willamette Basin Mitigation Plan at a later date, based on the potential level of habitat gain.

V.C Magnitude of Loss: Consequences

Habitat loss is the most critical problem facing the survival and management of wildlife species today; not only in Oregon, but around the world. 'This loss of habitat is a two-fold problem. Not only is the

habitat permanently lost in many cases (e.g., the removal of tropical rain forests whose delicate ecological balance, once destroyed, cannot be restored on the fragile, nutrient-poor soils in which they grow); but the quality of the remaining habitat is reduced and its capacity to support wildlife greatly diminished. Forests that covered approximately one-fourth of the earth's land area as recently as 1960, will likely cover only one-sixth by the year 2000 (Council on Environmental Quality, 1980 in Harris, 1984).

In Oregon, we cannot isolate the hydroelectric losses identified in this plan, from the larger problem of habitat reduction throughout the State. Because of the scope of the problem, the cost to recoup individual losses is greater (i.e., there is less available habitat), and the recovery of these habitats becomes more important to specific animal populations and species. Although, for example, the standing timber volumes of the United State's forests have increased from the lowest levels (in the 1930's), several attributes of todays "new" forests reduce their value to wildlife. These attributes are, specifically, the conversion of naturally structured and regenerated forests to even-aged monoculture plantations; and fragmentation of remaining natural forests into progressively smaller patches isolated. by (timber) plantations or by agricultural, industrial or urban development (Harris, 1984).

The belief that creation of national parks and nature reserves, although critical to maintaining many plant and animal species, can reverse the effect of widespread habitat loss on species survival, is not justified. Most existing protected areas are small, have odd shapes and are isolated (Harris, 1984). According to a recent study by W. Newmark of the University of Michigan at Ann Arbor, nearly all national parks in western North American have lost some species of animals since they were established, chiefly because the lands were too small to sustain them (M. Ritter, "Mammal Losses Found in Most National Parks," Oregonian, 29 January 1987).

For these reasons, wildlife management opportunities? such as those outlined in this mitigation plan, are crucial to the maintenance of habitat for wildlife. Important aspects of this plan pertinent to species maintenance and survival, are the emphasis on active wildlife management, and proximity to and coordination with public forest lands, to maximize habitat benefits. As discussed in Section IV.A, this management approach does not prevent some of the timber resource from being harvested.

This Mitigation Plan, in conjunction with the previous status reviews and loss assessments, meets the criteria of Section 1004(d.1) of the CRB Fish and Wildlife Program for acquisition of wildlife habitat. In summary:

A. The need for and level of mitigation at the eight federal projects was documented and agreed upon, through the process outlined in Section 1004(b) of the CRB Fish and Wildlife Program (see status reviews and loss assessments).

B. A mitigation implementation plan has been developed that attempts to identify both the most cost-effective and biologically-effective approach to mitigation. Consistent with Sections 4(h) (5) and (6) of the Northwest Power Act, the mitigation plan is based on the best available scientific knowledge; coordinates mitigation activities with ongoing state and federal management needs; and explores the most productive, cost-effective mitigation alternatives.

C. Consultation and coordination activities have taken place pursuant to Section 1304(c)(2) of the CRB Fish and Wildlife Program (Appendix A).

D. The mitigation proposal included in this report is as detailed as possible. It includes the identification of specific mitigation opportunities consistent with the plan's objectives; cost estimates for implementation and a scheduling format; identifies pertinent state and federal laws and regulations, as well as existing wildlife management needs; specifies O&M and monitoring needs; and has a sound biological basis.

VI. **61 ossary**

affected area - a term used in this report to denote that area directly affected by hydroelectric **construction** and operation; includes the reservoir, project facilities, staging areas', and relocated roads.

animal damage - injuries inflicted upon forest tree, seedlings, and young trees through seed foraging, browsing, cutting, rubbing, or trampling; usually by animals, but sometimes birds.

big game - state wildlife agency designation **for large mammals** some of which are hunted (e.g., deer, elk, bear, cougar); while others are fully protected (e.g., Columbian white-tailed deer).

buffer strip or zone - an area of vegetation left or managed to reduce the impact of a treatment or action of one area on another.

canopy - the more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

canopy closure - the progressive reduction of space between tree crowns **as** they spread laterally; the percent of ground area covered by the tree and shrub canopy when viewed from overhead.

carrying capacity - level of use which can be **accommodated** and continued without irreversible impairment of natural resources productivity. The maximum number of animals an area can sustain without suffering vegetation and other habitat damage.

cavity - a hole or opening in a snag or living tree caused by fire, rot, limb breakage, or produced by a primary excavator (e.g., woodpeckers); used for roosting, reproduction, and hiding or thermal cover by many wildlife species.

Class I streams - waters which are valuable for domestic use, are important for angling or other recreation, or are used by significant numbers of fish for spawning, rearing or migration routes.

climax plant community - the mature stage of the plant succession process that is final and stable. At this point the ecosystem is relatively unchanging (Goudie, 1984).

closed sapling-pole-sautilber stand condition - a stand condition in the forests of western Oregon where trees are passing through the sapling and pole sizes and entering the sawtimber size, and where there is a closed crown canopy; average stand diameter is between 1 and 21 inches **d.b.h.,** and crown cover exceeds 60 percent.

commercial forest 1 and - forest 1 and that is now producing,' or is capable of producing, at least 20 cubic feet per acre per year of commercially important tree species.

commercial thinning - the removal of a portion of the merchantable material from a forest stand to allow for better growth of remaining trees.

community - a group of one or more populations of plants and animals in a common spatial arrangement; an ecological term used in a broad sense to include groups of various-sizes and degrees of integration..

conifer - an order of the botanical group Gymnospermae comprising a wide range of trees, mostly evergreens, that bear cones and have needle-shaped or scale-like leaves; timber commercially identified as softwood; in western Oregon, the most important fiber-producing conifers are Douglas-fir and several species of pine, hemlock, spruce, true fir and cedar.

cover - vegetation used by wildlife for protection from predators (i.e., hiding cover), to make weather conditions more tolerable (i.e., thermal cover), or in which to reproduce (i.e., reproductive cover).

critical habitat - living area essential to the survival and perpetuation of a species either as individuals or as a population.

crown - the upper part of a tree or other woody plant, carrying the main branch system and foliage.

crown closure - see canopy closure.

crown cover - the amount of canopy provided by branches and foliage of trees, shrubs, and herbs in a plant community; may be specified by species, kind of plant, or collectively.

cull - a green tree, snag, or log that is nonmerchantable or of low economic value because it does not meet certain minimum specifications.

cutting unit - a definitive area on which the trees have been, are being, or are planned to be cut.

dabbler duck - any of various species of ducks (e.g., mallard, shoveller) that feed in shallow water areas.

d.b.h. - see diameter breast high.

&ad and down woody material - all woody material, from whatever source, that is dead and lying on the forest floor..

dead storage - that reservoir water which is stored below the lowest outlet of a dam and which is therefore unavailable for downstream uses.

decadent - when used in reference to forest stand condition there are inferences of the loss of trees from the overstory and of the presence of disease, or indications of loss of vigor in some of the dominant trees. These attributes produce habitats and microclimates important to many species of wildlife.

deciduous - perennial plants, trees and shrubs that are leafless for some time during the year (e.g., maple trees).

diameter breast high (d.b.h.) - the standard diameter measurement for standing trees, including bark, taken at 4.5 feet above the ground.

di versi ty - the relative degree of abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area.

diving duck - any of various species of ducks (e.g., bufflehead) that frequent deep waters and obtain their food by diving.

ecological niche - the position that a particular, plant or animal occupies in the ecosystem with regard to its interactions with other organisms and the utilization of its environment.

ecosystem - natural system including all the component organisms together with the non-living environment.

edge - the place where different plant **communities** meet or where different successional stages or vegetative conditions within plant **communities** come together, producing greater plant and animal diversity than found in non-edge areas.

edge effect - a term used to indicate the increased richness of flora and fauna occurring in the transition zone where two plant conanunities or successional stages meet and mix.

emergent vegetation - aquatic **plants** which are not totally submerged; typically they are rooted in an aquatic environment but most of the photosynthesis occurs above water (e.g., cat-tails).

endangered species - a plant or animal species which is in danger of extinction throughout all or a significant portion of its range because its habitat is threatened with destruction, drastic modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors; federally endangered species are officially designated by USFWS and **published** in the Federal Register.

even-aged stand - a 'natural forest stand or a managed one in which trees are essentially the same age.

exclusive power storage - reservoir water reserved exclusively for power production.

fauna - animals or animal life; the animals or animal life of a region, period, or geological stratum.

f1oodplain - the area adjoining a stream, tidal estuary or coast that is subject to flooding.

forage - vegetation used for food by wildlife,' particularly ungulate wildlife and domestic livestock; to search for food.

forb - fleshy leaved, herbaceous plants that are not rushes or sedges.

forest succession - the orderly process of change in a forest as one plant **community** or stand condition is replaced by another, evolving toward the climax type of vegetation.

functional old-growth forest - a term used in this report to identify a forest condition that is at least 90 years old, but is not "true" **old-growth** (see old-growth forest). Considered to possess some preliminary "older-growth" characteristics such as trees of d.b.h. greater than 21" (large sawtimber), presence of snags and some down material (see optimal thermal cover). Provides optimal thermal cover for elk.

grass-forb stand condition - a stand condition in the forests of western Oregon dominated by grasses and forbs; tree regeneration is generally less than five feet tall.

guild. - a group of plants or animals that have ecological interrelat**ion-**ship and a similar mode of life (e.g., species which use tree boles for nesting).

habitat - the sum total of environmental conditions of a specific place occupied by plant or animal species or a population of such.species.

habitat component - a part of an area or type of environment necessary to an organism or biological population for survival needs.

habitat niche - the peculiar arrangement of food, cover, and water that meets the requirements of a particular species.

habitat suitability index (HSI) - the HSI is a number between 0 and 1.0, and is a quality index of the capacity of a habitat to meet a species life requisites. It is obtained by dividing the study area habitat conditions by the optimum habitat conditions for that species.

habitat type - a specific type of plant community (e.g., a marsh), within which one might expect to find certain types of animals.

habitat unit (HU) - the product of the Habitat Suitability Index **(HSI)** and the acres of available habitat to indicate the relative importance of the habitat to a specific wildlife species; one HU is equal to one acre of optimum or prime habitat for a specific wildlife species.

hard snag - a snag composed primarily of sound wood, generally merchantable.

hardwood - broad-leaved trees belonging to the botanical group **Angiospermae;** the wood produced by these trees; in western Oregon, the most important hardwoods are red alder, Oregon ash, black cottonwood, Pacific **madrone,** chinkapin, **tanoak,** California-laurel, and several species of maples, oaks, and willows.

head - the height of the column of water above the turbines required to produce sufficient pressure to operate the turbines.

herbaceous ground cover - vegetation growing close to the ground that does not develop persistent woody tissue, and usually lasting for a single growing season; commonly referred to as "herbs."

hiding cover (specific to deer and elk)- any vegetation capable of hiding 90 percent of a standing adult deer or elk from human view at a distance of **200** feet or less; generally, any vegetation used by deer or elk for security or escape purposes.

impact - the effect of one thing upon another.

indicator species - in wildlife management, the welfare of a selected species is presumed to indicate the welfare of other species because of similar life requisites.

'inactive storage - reservoir water not. normally released for project purposes.

intensively managed forest stand - a forest managed to attain maximum growth through application of silvicultural practices (e.g., thinning, fertilization, reduction of competition).

key mitigation sites - a term used in this report to identify representative sites in the close vicinity of the affected areas that could provide general purpose winter range values and some riparian and **old-**growth forest values.

1 acustri ne - of, relating to, or growing in lakes.

land base - the amount of land with which the land manager has to work.

large sawtimber stand condition - a stand condition in western Oregon forests where dominant trees exceed 21 inches d.b.h.

lichen - any of numerous complex thallophytic plants made up of an alga and fungus growing in symbiotic association.

1 i tterfall - the freshly fallen or slightly decomposed vegetative material on the forest floor; leaves, bark fragments, flowers, fruit.

managed forest - a forest that has been brought under management to accomplish specified objectives, usually increased wood production.

maximum conservation pool - the maximum level to which a reservoir can be filled without jeopardizing summer flood control.

microclimate - the climatic conditions within a small or local habitat that is well defined.

migration - generally seasonal movement of animals, birds, or fish from one area to another.

miniu flood control pool - the level at which 'reservoir water is held during the peak flood season.

minimum power pool - the lowest level to which reservoir water can be drafted during power production.

mitigation - actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

monitoring - any and all actions which may be undertaken in order to assess the survival success of a species over time, or to evaluate the results of a management action or activity upon the species habitat.

monoculture - the raising of a crop (e.g., timber or agricultural crop) consisting of only one species; such crops are usually even-aged.

multi-layered canopy - forest stands with two or more distinct tree layers in the canopy; synoymous with multi-storied stands.

multiple use - a concept of land management in which a number of resources are produced simultaneously from the same land base; such as wood, water, wildlife, recreation, and grazing.

nest box - a box with an entrance, hole into a hollow interior; these boxes provide nesting and roosting sites primarily for secondary cavity-using species in lieu of natural cavities.

nongame wildlife - wildlife that is not normally fished, hunted or taken for fur. Definition varies by states (Marshall, 1986).

old growth - a forest stand several hundred years old comprised of many large trees, large snags, and numerous large down logs; having a multi-layered canopy composed of several tree species; trees showing signs of decadence; may be the last stage in forest succession; western Oregon forests begin exhibiting old-growth characteristics at about 175-250 years of age; the most extensive type of old-growth is the Douglas-fir/ western hemlock forest of which individual trees live for 350-750 years. The determination of whether a stand is true old-growth is based more on structural characteristics than on age (Gordon et al. 1982).

open sapling-pole stand condition - a stand condition in western Oregon in which the dominant vegetation is trees that qualify as poles or saplings or both, and where the crowns have not closed; saplings are l-4 inches d.b.h., poles are 4-9 inches d.b.h., and crown cover does not exceed 60 percent.

optimal thermal cover - habitat for deer and elk which has tree overstory and understory, shrub, and herbaceous layers; the overstory canopy generally exceeds 70 percent crown closure and dominant trees generally exceed 21 inches d.b.h.; provides snow interception, thermal cover, and maintenance forage.

overstory - the portion. of the trees that form the uppermost canopy layer in a forest of more than one story.

partial cut - any timber harvest that removes some trees while leaving others standing for some management purpose.

pole - a young tree, from the time its lower branches begin to die until the time the rate of crown growth begins to slow and crown expansion is noticeable; poles are **4-9 inches** d.b.h.

power pool - see minimum flood control pool.

precommercial thinning - the practice of removing some trees of less than merchantable size **from** a stand so that the remaining trees will grow faster.

preserve - to save from change or loss and reserve for a special purpose.

prey base - those animals used as a reliable food source for another species.

primary cavity nesters - wildlife species that excavate cavities in snags (e.g., woodpeckers).

private 1 and - land belonging to a private individual; ODFW has jurisdiction for wildlife on private lands.

protect - save or shield from loss, destruction or injury for future intended use.

public land - land owned by the state or federal government.

range (e.g., "home" range) - the general area occupied by animals, often on a seasonal basis, such as elk winter range. Not usually defended.

raptor - predatory birds (e.g., falcon, hawk, eagle, owl) that have feet with sharp talons or claws adapted for seizing prey, and a hooked beak for tearing flesh.

regeneratipn - the renewal of the tree crop by natural or artificial means; also, the young crop.

restore - revitalizing, returning, or replacing original attributes and amenities, such as natural biological productivity, which have been diminished or lost by past alterations, activities, or catastrophic events.

riparian vegetation (riparian zone) - vegetation adapted to moist growing conditions found along waterways and shorelines. The term is most often used in association with streamside vegetation.

riverine - relating to, formed by, or resembling a river.

rotation (i.e. timber) - the planned number of years between the regeneration of an even-aged stand and its final cutting at a specified stage.

salvage - the dead, dying, or deteriorating woody material removed from the forest and sold. This removes potential wildlife habitats.

sapling - a young tree that is no longer a seedling but not yet a pole; a tree l-4 inches d.b.h.

sawtimber (coniferous) - trees with a minimum diameter of 9 inches d.b.h. that can produce at least one **sawlog** 12 feet in length with a minimum top diameter of 6 inches inside bark.

secondary cavity nester - wild1 i fe (e.g. raccoon) that occupies a cavity in a snag that was excavated by another species.

second growth - forest stands in the process of regrowth after an earlier cutting or disturbance; in comnon usage it is second-growth that follows removal of old-growth forests.

seedling - a young tree grown from seed from the time of germination until it becomes a sapling.

selection cutting - the periodic removal of trees, individually or in small groups, from an uneven-aged forest in order to realize the yield and establish a new tree crop.

seral cmunities or stages - a preclimax stage of succession; relatively transitory communities that successively develop toward the climax condition.

shelterwood cutting - regeneration designed to establish a new tree crop under the protection of remnants of the old stand. As the new stand is established, the older trees are removed.

shrub stand condition - a stand condition in the forests of western Oregon in which the vegetation of the stand is dominated by shrubs less than 10 feet tall and less than 30 percent crown cover.

sight distance - re. big game: the distance necessary to hide 90 percent of a large animal from view in a given cover type. (See hiding cover).

silvicultural prescription - a written plan of action to carry out silvicultural treatments to produce a desired result in terms of stand composition and condition.

site – an area considered in terms of its environment, particularly as this determines the type; quality, and growth rate of the potential, vegetation.

site class – a measure of the relative productive capacity of an area for timber or other vegetation.

slash – the residue (branches, bark, tops, cull logs, broken or uprooted trees) left on the ground after logging has been completed.

snag – a standing dead tree.

snag dependent species – birds and animals that are dependent on snags for nesting, roosting, or foraging habitat.

snag recruitment – the process by which new snags become available for wildlife use; may be the result of natural mortality or the selection and treatment of living trees.

soft snag – a snag composed primarily of wood in advanced stages. of decay and deterioration, generally not merchantable. More accessible to wildlife than hard snags.

softwood – the wood produced by coniferous trees.

special habitat – a habitat which has special function not provided by plant communities and successional stages (e.g., riparian zones, snags, dead and down woody material, edges); can be created or altered by management.

stand condition – the structure of forest stands resulting from timber harvest, fire, or other disturbance, and classified into six conditions similar to successional stages: grass-forb; shrub, open sapling-pole, closed sapling-pole-sawtimber, large sawtimber, old growth.

structural replacement goal – the goal of this mitigation plan to replace the general structure of the preconstruction habitat (49% general use winter range, 25% riparian, 26% old-growth forest).

succession – the changes in vegetation and in animal life that take place as the plant community evolves from bare ground to climax.

summer range – an area used by animals during the summer months; usually at higher elevations or on north and east exposures.

sustained yield or production – the yield that a forest can produce continuously from a given intensity of management; implies continuous production.

talus – the accumulation of broken rocks that occurs at the base of cliffs or other steep slopes.

target species – see indicator species.

thermal cover - geomorphic or vegetative cover used by animals to modify the adverse effects of weather.

thinning - felling of part of an immature crop or stand to accelerate growth in the remaining trees.

threatened species - a plant or animal species which is likely to become an endangered species in the foreseeable future (throughout all or a significant portion of its range) because its habitat is threatened with destruction, drastic modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors; federally-listed threatened species are officially designated by USFWS and published in the Federal Register.

trade-off - an exchange of one thing in return for another; especially a giving up of something desirable, as a benefit or advantage, for something regarded as more desirable.

travel corridor - a route followed by animals along a belt or band of suitable cover or habitat. Riparian zones are frequently used as travel corridors.

understory - vegetation (trees, shrubs, herbs) growing under the canopy formed by taller trees.

uneven-aged stand - a forest stand, natural or managed, containing a mix of trees that differ markedly in age.

ungulate - a mammal with hooves.

unique habitats - wildlife habitats (i.e., cliffs, caves, and talus) created by geomorphic features. Provide diversity to an environment otherwise dominated by plant communities (Thomas, 1979).

viable population - a wildlife population of sufficient size to maintain its existence over time in spite of normal fluctuations in population levels.

westside - referring to the geographical area west of the summit of the Cascade Range in Oregon.

wetlands - lands which are covered by shallow water or are periodically saturated with the water table at, near, or above the soil surface; wetland soils retain sufficient moisture to support aquatic or semi-aquatic plant and animal life.

wildlife - all nondomestic animals.

winter range - an area used by animals during the winter months; usually at lower elevation and on south and west exposures.

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VIII. APPENDICES

Appendix A: Interagency Consultation and Coordination

Table 1:
Interagency mitigation teams responsible for evaluating representative mitigation sites

Site	Name	Agency
	Big Game Winter Range	
Detroit Reservoir		
1. Blowout Creek:	Dave Black (USFS), Geoff Dorsey (USACE), Larry Gangle (USFS), Jim Heintz (ODFW), Jim Noyes (ODFW), Mary Potter, recorder (ODFW), Sue Preston, facilitator (ODFW), Pat Wright (USFWS).	
2. Whitewater Creek:	Dave Black, Geoff Dorsey, Larry Gangle, Jim Heintz, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator, Pat Wright, John Sandberg (USACE).	
Green Peter Reservoir		
1. Middle Santiam	Geoff Dorsey, Larry Gangle, Jim Heintz, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator, Pat Wright, John Sandberg.	
2. Runbaugh Creek:	Geoff Dorsey, Larry Gangle, Jim Heintz, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator, Pat Wright, John Sandberg.	
3. Three Creeks:	Geoff Dorsey, Larry Gangle, Jim Heintz, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator, Pat Wright, John Sandberg.	
Hills Creek Reservoir		
1. Simpson Creek:	Geoff Dorsey, Larry Gangle, Jim Heintz, Jim Noyes, Mary Potter,-recorder, Sue Preston, facilitator, Pat Wright John Sandberg, Brian Ferry (ODFW), Kat Pipes (USACE), Ken Kestner (USFS), Ron Mecklenberg (USFS)	
2. Skunk Creek-Pioneer Gulch:	Geoff Dorsey, Larry Gangle, Jim Heintz, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator, Pat Wright, John Sandberg, Brian Ferry, Kat Pipes, Ken Kestner, Ron Mecklenberg.	

Table 1 (continued)

Site	Name	Agency
Lookout Point Reservoir		
1. Green Butte:	Brian Ferry, Larry Gangle, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator.	
Cougar Reservoir		
1. Quart Creek-Lytle Creek:	Geoff Dorsey, Brian Ferry, Larry Gangle, Jim Noyes (ODFW), Marry Potter, recorder, Sue Preston, facilitator, Pat Wright, Dee Dee Twitchell (USFS).	
Riparian Habitat		
Willamette River Greenway		
1. Brown-Minto Park:	Charlie Bruce (ODFW), Geoff Dorsey, Larry Gangle, John Grentenburger, observer, (USACE), Wayne Logan (BLM), Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator, Neil TenEyck (ODFW), Pat Wright.	
Santiam Drainage		
1. Thomas Creek:	Charlie Bruce, Geoff Dorsey, Larry Gangle, John Grentenburger, observer, Wayne Logan, Jim Noyes, Mary Potter, recorder, Sue Preston, facilitator Neil TenEyck, Pat Wright.	

Table 2:

Summary of Interagency Coordination Activities
during development of Mitigation Plan

Date	Agency Participation	Summary
17 Dec 1985	BLM, BPA, NPPC, ODFW, PNUCC, USACE, USFWS, USFS	Discussed Green Peter/Foster and Detroit/Big Cliff Loss Assessments, Willamette projects Summary Report and expectations for mitigation plan.
10 Apr 1986	BLM, ODFW, USFS, USFWS	Discussed possible mitigation sites and activities for target species.
29 May 1986	BPA, ODFW, PGE, PNUCC, NPPC, PP&L, USACE, USFS, USFWS	Consultation and coordination on the mitigation plan work statement and target species.
12 Aug 1986	ODFW, BLM, USFS, USFWS	Designated potential big game winter range and wetland mitigation sites.
4 Sept '1986	BLM, ODFW, USFS, USACE, USFWS	Selected potential winter range mitigation sites for evaluation.
9-12 Sept 1986	ODFW, USACE, USFWS, USFS	Field evaluation of potential winter range mitigation sites.
29 Oct 1986	BLM, ODFW, USACE, USFS, USFWS	Field evaluation of potential riparian mitigation sites.
17 Nov 1986	ODFW, OSPR	Discussed potential of Willamette River Greenway parcels as mitigation sites.
18 Nov 1986	ODFW, BLM, USFS, USACE USFWS	Discussed mitigation goals, allocation of mitigation effort, and tradeoff mitigation.
26 Nov 1986	ODFW, OSPR	Prioritized acquisition of Greenway mitigation parcels, and discussed enhancement opportunities on OSPR Greenway lands.

Table 2 (Cont.

Date	Agency Participation	Summary
15 Dec 1986	BLM, ODFW, USFWS, USFS, BPA, NPPC	Discussed agency expectations and guidance regarding mitigation plan. Explained mitigation goal concept.
8 Jan 1987	ODFW, USFWS, USFS	Final discussion prior to completion of draft. Review 18-page "Mitigation Memo" sent out ahead of time, outlining approach, shopping list, etc.
29 Jan 1987	ODFW, USFS, USFWS,, BLM, USACE	Section IV.A.6 sent out for review to clarify positions on aspect of old-growth forest mitigation. Written response requested.
9 Mar 1987	ODFW, USFS, USFWS, USACE, NPPC, BPA, TNC FERC	Consultation and coordination on Draft Mitigation Plan

Appendix B: An Analysis of the Responsibility of Hydropower to Mitigate Losses to Wildlife and Wildlife Habitat

The Willamette Basin projects are multi-purpose facilities built primarily for flood control, but also authorized for power generation, irrigation, navigation, domestic water supply, recreational use, and pollution abatement (i.e. dilution of domestic and industrial pollutants during low-flow periods). The Power Act specifically addresses "mitigation, enhancement and protection" for impacts from "the development and operation" of hydroelectric facilities.

The losses sustained by wildlife from inundation of habitat approaches 100 percent. Because the authorized purposes are overlapping, in terms of the function of the dams and reservoirs, the specific percentage of habitat loss attributable to hydropower is difficult to ascertain. This is an important topic, and was addressed in the February 1986 "Montana Issue Paper" on the Hungry Horse Dam Mitigation Proposal, produced by the Power Council staff. In this Issue Paper, opinion was split. PNUCC and the USACE felt the ratepayers (through BPA) should pay only for that portion of the total project cost initially allocated to hydropower production. The wildlife agencies generally felt that the initial project cost allocation did not adequately reflect benefits accrued by hydropower (e.g. in terms of water levels maintained to supply sufficient "head" for power production). The proportion of hydropower responsibility is generally interpreted as a method of setting a "cap" on dollars spent for wildlife mitigation. We feel strongly that this proportion must represent a reasonable balance between wildlife losses identified at specific projects in the loss assessments, and the actual benefits that hydropower production realizes from reservoir function on a project by project basis. In an extreme case, actual water-use by hydropower could represent nearly 100 percent, whereas it may represent a much lower proportion based on multi-use authorization purpose. In order to address this potentially large "gap" between purpose authorization for hydropower and realized benefits, and its relationship to "fair" compensation to wildlife for loss of habitat, six allocation methods were investigated. The six alternatives are discussed below and are summarized in Table 1, following the discussions.

Preferred Alternative: Water Use

The development of federal hydropower projects in the Willamette Basin resulted in permanent, 'direct impacts' to 20,123 acres of wildlife habitat. The effects of that habitat loss to wildlife was estimated in the Loss Assessments published for each project in 1985.

Although the primary purpose of the Willamette Basin projects is flood control, power needs exert a strong influence on the operation of these projects. Within the limits of flood control, reservoir releases and storage during the six winter months are determined by the power requirements (U.S. Congress, 1949).

To measure the influence of power generation on reservoir operations, we assessed the proportion of total water releases that went through the turbines for each of the eight projects. Power outflow data from the Reservoir Control Center in Portland were totalled for all years of (each) project operation and divided by the total outflow for all purposes to derive the proportion of water releases actually used to generate electricity. Based on these figures, hydropower generation accounts for 70-93 percent of the actual use of water stored in the reservoirs Table 1). This proportion of water use ranges from 17-45 percent over the "authorized" hydropower portion for each of the eight projects as identified in Alternative 2. It is our opinion that the wildlife losses attributed to hydropower responsibility should be equal to the proportion of reservoir releases that provide power benefits. If power benefits are not constrained by project purpose authorizations, why should wildlife mitigation responsibility be so constrained? We feel they should be treated equally.

Alternative 2: Congressional Repayment Formula

This method was proposed by the Power Council staff in the 1986 Montana Issue Paper. It uses the percent of project costs that are borne by the different project purposes as the basis for allocating mitigation responsibility. The "repayment" 'refers to the percent of total returnable dollars from plant investment. Repayment allocations for each project, obtained from a 1984 "Schedule of Amount and Allocation of Plant Investment" from BPA's Annual Report, are given in Table 1. The repayment formula addresses the economic emphasis given power generation in development of the projects, but does not measure the actual extent of use by the various functions in operation of the facilities. This economic-based approach has little relevance to hydropower responsibility for impacts to wildlife habitat because it in no way addresses wildlife losses. The Regional Power Act specifies "measures to protect, mitigate and enhance fish and wildife affected by the development, operation and management" of these projects (Sec. 4(h)(5)).

Alternative 3: Operation and Maintenance Expenses

This is another economic approach to determine the responsibility of electric power production to mitigate for impacts to wildlife and wildlife habitat. Using this method, the average proportion of total operation and maintenance expenses attributed to power was calculated for all years of project operation, displayed in Table 1 (pers. comm., June 13, 1986, R. Cramer, USACE Finance and Accounting, Portland).

This method also fails to represent the actual operation of the projects and does not address wildlife losses or the intent of the Regional Power Act.

Alternative 4: Benefit Analysis

This allocation method, preferred by the USACE, relies on the distribution of economic benefits from each project function. This analysis is

Allocation Report for the Lookout Point Project, "The entire development on the Middle Fork is in reality one project, consisting of three units, and there is no practical way to allocate or distribute benefits among the units or to segregate and measure the interacting influences". Data used in this analysis were obtained from the USACE Cost Allocation Reports for each project published in 1967 and filed at the USACE Portland District Office, and also through personal communication with D. Wagner, USACE Economics, Portland, during May 1986.

As with the other economic allocation methods, this approach does not adequately represent the effects of project development and operation, nor does it address wildlife losses.

Alternative 5: Area of Power Pool

This method calculatesthe acres represented by the power pool as a proportion of the maximum conservation pool, displayed in Table 1.

The benefit of this method is as an area approach, rather than economic, to apportion the hydropower responsibility for wildlife habitat losses. It's major shortcoming, however, is its failure to acknowledge that much of the inundated area attributed to the conservation pool is used for electric power production (see the Preferred Hydro Allocation Alternative).

Alternative 6: Storage Allocation

Hydropower responsibility for wildlife losses is estimated by this method as the percent of total usable storage (in acre-feet) allocated to power and conservation uses (pers. comm., 3. Hanson, July 1986 based on 1969 Pertinent Reservoir Data, USACE, Res. Reg. Water Quality Sec., Portland). This approach accounts for water stored in the conservation pool used to generate electricity (see Preferred Alternative) and, by focusing on water volume, partially addresses inundated wildlife habitat. References in House Documents 544 and 531 (U.S. Congress, 1938 and 1949) and the USACE Cost Allocation Reports, indicate varying percentages of available water storage can be used for power production, depending on factors such as yearly water flow. The figures in Table 1 are basically maximum values, but are undependable in terms of mitigation allocation because of annual variability. For this reason, we prefer Alternative 1, which depends on the more accurate measure of water that is actually used for power production based on what goes through the turbines.

'Table 1. Methods for allocating hydropower responsibility for wildlife habitat losses, Willamette River Basin, Oregon.

Method	Percent of Project Functions Allocated to Power Production							
	Cougar	Hills Creek	Lookout Point	Dexter	Green Peter	Foster	Detroit	Big Cliff
1) Water use (all years) (Power outflow/all releases)	74%	79%	93%	76%	90%	70%	89%	78%
2) Congressional repayment formula	31	36	48[a]	48	55[a]	55	61[a]	61
3) Operation and Maintenance expenses for power	48	52	56[a]	56	62[a]	62	73[a]	73
4) Benefit analysis	13	15	30[a]	3 0	16[a]	16	34[a]	34
5) Area of power pool	50[b]	58[b]	47	95	56	75	45	55[c]
6) Storage allocation	93	98	96	67[d]	94	85	94	82[d]

a Projects combined with reregulation reservoirs (i.e., Lookout Point/Dexter; Green Peter/Foster; Detroit/Big Cliff).
b Based on minimum flood control pool, which is equivalent to the level of exclusive power storage.
c Calculated from minimum power pool, thus less than actual proportion.
d Power storage only; does not include conservation pool also used for power.

Appendix C: Hydroelectric impacts on habitat categories and target species

Table 1. Impacts of USACE Willamette Basin Federal hydroelectric facilities on vegetation cover types (Acre.3 lost or Gained[a])

Veget at ion Cover Type/ Map Category	McKenzie drainage	Mid-Willamette drainage			Santiam drainage				Total Willamette Basin
	Cougar	Hills Creek.	Lookout Point	Dexter	Detroit	Big Cliff	Green Peter	Foater	
Big Game Winter Range									
Temperate conifer forest, pole				+8	-886	-32	-347	-1	-1,266
Tamperate conifer forest, aawt imber	+156[b]	-231[b]	-309b	-3b	-410	-103	-621	-8	-1,529
Conifer-hardwood forest	+16	-102	-116	-7	+128	+17	-263	-253	-580
Shrub1 and	+52	-246	-146	-72	-983	-14	-582	-186	-2,177
Crass-forb	+24	+142	+112	+99	-270	+2	-1,429	+31	-1,289
Red alder	+10		-241	-71	-209	-23	+20	-1	-515
Deciduous hardwood (oak)		+5	-24	+15					-4
Oak savannah				-105					-105
Agricultural cropland		-122	-713	-281	-22			-423	-1,561
Agricultural pasture		-49	-372	-125	-23		-188	-58	-815
Agricultural orchard			-94						- 9 4
Old growth Forest									
Temperate conifer forest, old-growth	-1,587	-2,694	-724		-177		-2		-5,184
Riparian Habitat									
Riparian shrub	+14	-11	-109	-46	-22		-14		-188
Riperian hardwood	-195	-196	-1,009	-399	-578	-20	-159	-104	-2,660
Coniferous wet land		+20							+20
Herbaceous wetland					+7		-12	+2	-3
Sand/gravel/cobble	-34	-71	-219	-176	-50		-32	-50	-632
Ponds							+7		+7
River	-71	-119	-442	-135	-310	- 7 2	-213	-159	-1,521
Other									
Rocky cliffs/talus							+3		+3
Disturbed/bare/rock	+345	+481	+165	-167	+71	+104	+272	+68	+1,673
Residential/urban/industrial		+4	-21	+106	+154		-45	-53	+145
Reservoir	+1,280	+2,710	+4,255	+1,025	+3,580	+141	+3,605	+1,195	+17,791
									-20,123 Acres[c]

[a] From preconstruction to recent conditions.
[b] Includes some pole-sized trees also.
[c] Directly impacted no recovery.

Table 2. Impacts of USACE Willamette Basin Federal hydroelectric facilities on loss assessment target species (Habitat value (HU's) lost or gained)

	McKenzie drainage		Mid-Willamette drainage			Sant iam drainage			Total Willamette Basin
TARGET SPECIES	Cougar	Hills Creek	Lookout Point	Dexter	Detroit	Big Cliff	Green Peter	Foster	
Big a n e									
Black-tailed deer	-1,192	-2,912	-4,043	-1,078	-3,061	-81	-3,997	-890	-17,254
Roosevelt elk	-1,484	-3,203	-3,668	[a]	-2,210	-81	-3,997	-652	-15,295
Black bear	-1,856	-2,958							-4,814
Cougar	-1,472	-2,381							-3,853
Furbearers									
Beaver	-189	-326	-1,739	-832	-715	-50	-381	-245	-4,477
River otter	-189	-384			-882	-38	-575	-340	-2,408
Mink			-1,586	-832					-2,418
Red fox			-2,082	-508					-2,590
Upland Game									
Ruffed grouse	-293	-468	-2,457	-701	-3,028	-81	-3,264	-853	-11,145
California quail			-1,937	-664				-385	-2,986
Ring-necked pheasant			-1,654	-332					-1,986
Band-tailed pigeon							-3,487		-3,487
Western gray squirrel			-1,070	-284					-1,354
Waterfowl									
Hsr lequin duck	-282	-269							-551
Wood duck			-1,124	644				-179	-1,947
Common merganser			-95		+1,169	-11	-21		+1,042
Greater scaup				+820					+820
Waterfowl[b]	+100[c]	+323							+423
Nongmne									
Bald Eagle	+345	+486	+1,497	+168	+648	+20	+2,128	+401	+5,693
Osprey	+185	+44	+1,139	+226	+1,416	+20	+2,614	+525	+6,169
Spotted owl	-1,774	-2,977	-714		-246				-5,711
Pileated woodpecker	-1,938	-3,201	-1,614		-1,156	-71	-710		-8,698
American dipper	-285	-200	-350	-119					-954
Yellow warbler	-170	-210	-1,321	-654					-2,355

[a] Blank indicates species was not used as a target species at that project.

[b] Includes Barrow's and common goldeneye, bufflehead, and common merganser.

c Evaluation team determined net gain did not actually occur at Cougar Reservoir for waterfowl.

Appendix D: Wildlife Management Criteria, Activities, and Needs Within Oregon

I-. Background

The development of wildlife and wildlife habitat policies, goals, and standards by the Oregon Department of Fish and Wildlife (ODFW) has primarily occurred within the past decade. Until 1971, ODFW's management emphasis had been to maintain optimum game numbers to provide an annual crop for harvest (Mace 1953), as well as ensure reasonable access to lands that produced publicly-owned wildlife (McKean 1963). In 1971, the Oregon Legislature gave ODFW management responsibility for all wild-. life species within the state. In 1973, the statutes were recodified to reflect this new responsibility, and the wildlife policy became law.

ODFW developed a strategic plan in the early 1970's. A data base was established using 1970 wildlife population estimates and approximate acres of wildlife habitat per county.' The strategic plan presented goals and management strategies, but was never formally adopted by ODFW. In 1980, ODFW updated the 1970 wildlife data base. Biologists estimated the amount of wildlife habitat and number of animals per acre or square mile of habitat for each county or wildlife management unit within the state. Nongame wildlife information was in the form of relative abundance of each species rather than population estimates.

Wildlife Habitats in Managed Forests: The Blue Mountains of Oregon and Washington (Thomas, 1979) was completed in 1979 through the cooperative effort of resource managers from several state and federal agencies. It quickly became a source of common understanding for land and wildlife managers, and a touchstone for management plans to address wildlife needs. ODFW participated in development of the handbook and biologists began using these guidelines to assess land use plans.

The Fish and Wildlife Commission adopted Rocky Mountain elk and mule deer management objectives in 1981. At the same time, benchmark figures for black-tailed deer and Roosevelt elk populations were developed by ODFW biologists but were not formally reviewed by the public nor adopted by the Commission. ODFW reviewed its general policies in the early 1980's and in 1983 produced the Manual of Policies and Procedures (ODFW, 1983a). Within ODFW, the Habitat Conservation Division (nee Environmental Management Section) is charged with protection of fish and wild--life habitat and in 1983 produced the Forest and Rangelands Goals and Standards (ODFW 1983b) as a guideline for ODFW biologists. This publication incorporated standards from the handbook for the Blue Mountains (Thomas, 1979) and a similar handbook for western Oregon in draft at the time. In 1985, the Habitat Conservation Division also produced Fish and Wildlife Habitat Protection Criteria for Forest lands (ODFW, 1985). These criteria included standards from the Forest and Rangelands Goals and Standards (ODFW, 1983b), the Blue Mountains handbook (Thomas, 1979), and Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington (Brown, 1985).

Late in 1985, the Fish and Wildlife Commission approved ODFW's Oregon Nongame Wildlife Management Plan (Marshall, 1986) following another cooperative effort and extensive public review. The Nongame Plan is the most extensive and detailed of ODFW's management plans.

II. Policies, Goals, Standards and Responsibilities

A. State agencies

1. ODFW

ODFW has been given broad responsibility by the Oregon Legislature to manage the fish and wildlife resources of the state. The Wildlife Policy (ODFW, 1983-84) adopted in 1973 states:

> ORS 496.012 Wildlife Policy. It is the policy of the State of Oregon that wildlife shall be managed to provide the optimum recreational and aesthetic benefits for present and future generations of the citizens of this state. In furtherance of this policy, the goals of wildlife management are:
>
> (1) To maintain all species of wildlife at optimum levels and prevent the serious depletion of any indigenous species.
>
> (2) To develop and manage the lands and waters of this state in a manner that will enhance the production and public enjoyment of wildlife.
>
> (3) To permit an orderly and equitable utilization of available wildlife.
>
> (4) To develop and maintain public access to the lands and waters of the state and the wildlife resources thereon.
>
> (5) To regulate wildlife populations and the public enjoyment of wildlife in a manner that is compatible with primary uses of the lands and waters, of the state and provides optimum public recreational benefits.

In the early 1970's, ODFW developed Oregon's Sportfish and Wildlife Plan (ODFW, 1975). The document was a long-range strategic plan to the year 1990 for the purpose of implementing the policy and goals set forth in the statutes and to provide direction for improved management of Oregon's fish and wildlife (ODFW, 1975). The goals presented in the strategic plan included increases in or maintenance of wildlife populations, expanded distribution for some species, the provision for optimum hunting and viewing opportunities, and the prevention of extinction of any species of fish or wildlife in Oregon (ODFW, 1975). Although the strategic plan was never formally adopted nor an operational plan developed, many of the goals and strategies enumerated in the document guide wildlife management practices today (pers. comm., D. Eastman, ODFW). Current programs and activities such as expansion of Rooseveit elk distribution, establishment of desirable aquatic furbearers in suitable habitat, and acquisition of additional critical elk winter

range can be found in the Strategic Plan (ODFW, 1975). ODFW's Manual of Policies and Procedures includes very broad policy statements. It indicates ". ..the Department will cooperate fully with other agencies to implement laws and to develop coordinated resource management programs which protect fish and wildlife habitat," and further, "Habitat improvement programs will be vigorously pursued..." (ODFW, 1983a). In this way, ODFW recognized the attrition of habitat as a serious threat to the maintenance of healthy and diverse populations of fish and wildlife.

The Forest and Rangelands Goals and Standards (ODFW, 1983b) developed by ODFW's Habitat Division established habitat protection guidelines. In 1986, ODFW updated the 1985 Fish and Wildlife Habitat Protection Criteria for Forest Lands (ODFW, 1985) to define criteria believed necessary to assure maintenance and protection of. fish and wildlife habitat, and to provide statewide uniformity and consistency in the review of land use and USFS forest plans. These ODFW guidelines identify sensitive areas (e.g., band-tailed pigeon springs, eagle roosts) and recommend wildlife needs in sensitive areas receive priority, particularly for species of limited number or areas of restricted size. ODFW also recommends action be taken to maintain species and habitats of special concern, which include big game winter range, riparian habitat, mineral springs, old-growth forests, bald eagle, and northern spotted owl. Native species will receive preference in the management of wildlife resources, according to ODFW guidelines, and threatened and endangered species are of high priority. Deer and elk cover:forage ratios compatible with primary land uses for eastern and western Oregon are also recommended in the publications.

In 1981, the Oregon Legislature adopted the Riparian Tax Incentive law with the intent to maintain, conserve, and rehabilitate riparian lands for the benefit of the state and its citizens. Landowners of agricultural, range, or forest lands within counties with acknowledged land use plans are eligible to exempt riparian lands from taxation. This is done upon the agreement of the landowner and ODFW to a riparian management plan.

The Oregon Nongame Wildlife Management Plan (Marshall, 1986) was approved by the Fish and Wildlife Commission in 1985.

Nongame Wildlife Management Plan Content and Purpose

635-100-005 The Nongame Wildlife Management Plan provides program goal, objectives and strategies to identify and coordinate nongame wildlife management, research and status survey needs. The document provides direction to Oregon Department of Fish and Wildlife in carrying out its mandated responsibilities. It is also intended as an informational document to be used in wildlife programs by public agencies and others concerned with the conservation of nongame species. In addition, it provides voluntary guidelines to improve the nongame wildlife habitat of Oregon.

Nongame Program Goal

635-100-010 It is the Program Goal of the **Nongame** Management Plan to maintain populations of naturally-occurring Oregon **nongame** wildlife at self-sustaining levels within natural geographic ranges in a manner which provides for optimum recreational, aesthetic, economic, ecological, educational, scientific and cultural benefits, and where possible, is consistent with primary uses of lands and waters of the state.

Objectives of the **Nongame** Plan are: **1)** Maintain populations of all presently existing, naturally-occurring **nongame** species. at optimum levels **2)** Restore and maintain self-sustaining populations of **nongame** species extirpated from the state or regions within the state at levels consistent with habitat availability, public acceptance, and other uses of the lands and waters of the state, and **3)** Provide public enjoyment and recreational, educational, aesthetic, scientific, economic and cultural benefits derived from the state's **nongame** wildlife resource for citizens and visitors (Marshall, 1986).

In recognition of the significant economic benefit wildlife resources provide the State of Oregon, ORS 496.705 (ODFW, 1983-84) establishes the value of wildlife for the recovery of damages for unlawful taking or killing. Damages go as high as $750 for elk, and are $500 for any state or federally listed threatened or endangered wildlife species.

According to the 1980 National Survey of Fishing, Hunting and Wildlife Associated Recreation **(ODFW, 1986),** expenditures in Oregon during 1980 for hunting equipment and special equipment associated with hunting **totalled** about $148 million. The total addition to Oregonian's personal income for 1980 was estimated to be almost $150 million. An approximate 2.2 million people (nearly 90 percent of Oregon's population over six years of age) participated in some kind of nonconsumptive wildlife -activity in 1980, from special trips to observe wildlife to maintaining backyard bird feeders. Nonconsumptive users in the Pacific states had an annual average expenditure of $305 per person in 1980. for food, lodging, and equipment associated with wildlife trips. Assuming Oregon residents made the same expenditures, nearly $140 million was spent for nonconsumptive wildlife recreation in 1980.

2. Land Conservation and Development **Commission (LCDC)**

The Land Conservation and Development Commission directs the statewide planning program. Each city and county is required by law to adopt a comprehensive plan consistent with the statewide planning goals. The local comprehensive plans provide overall guidance for a **community's** land use, economic development, and resource management. Cities, counties, special districts, and state agencies must conform to the statewide planning goals **(LCDC,** 1985).

Four of **LCDC's** statewide planning goals have relevance to wildlife and wildlife habitat:

Goal 4, Forest Lands. Conserve forest lands for forest uses. Included among the forest uses referred to under this goal is fish and wildlife habitat (LCDC, 1985).

Goal 5, Open Spaces, Scenic and Historic Areas, and Natural Resources. Provide programs that will protect scenic and historic areas and natural resources for future generations. Fish and wildlife areas and habitats should be protected and managed in accordance with ODFW's fish and wildlife management plans (LCDC, 1985).

Goal 8, Recreational Needs. Destination resorts shall not be sited on areas protected as Goal 5 resource sites in acknowledged comprehensive plans; special reference is made to sensitive big game habitat generally mapped by ODFW and refined through development of comprehensive plans. Destination resorts must be compatible with the site and adjacent land uses, such as maintaining natural features like the habitat of threatened or endangered species, and riparian vegetation within 100 feet of streams, rivers and significant wetlands (LCDC, 1985).

Goal 15, Willamette River Greenway. Plans and implementation measures of the Willamette River Greenway shall provide for protection of significant fish and wildlife habitat. The natural vegetative fringe along the Willamette River shall be enhanced and protected to the maximum extent practicable (LCDC, 1985).

3. Oregon Department of Transportation (ODOT)

The 1973 Legislative Assembly adopted the Willamette River Greenway law and charged the Oregon State Parks and Recreation Branch of ODOT with coordination responsibility.

390.314 Legislative findings and policy.

(1) The Legislative Assembly finds that, to protect and preserve the natural, scenic and recreational qualities of lands along the Willamette River, to preserve and restore historical sites, structures, facilities and objects on lands along the Willamette River for public education and enjoyment and to further the state policy established under ORS 390.010, it is in the public interest to develop and maintain a natural, scenic, historical and recreational greenway upon lands along the Willamette River to be known as the Willamette River Greenway.

In 1975, LCDC adopted Statewide Planning Goal 15 which interprets the Greenway law and seeks to provide a means to implement that interpretation. The Willamette Greenway Program consists of the cooperative efforts of state agencies and local governments to carry it out. All state agency actions and plans must be consistent with the Greenway goal (ODOT, 1976).

4. Oregon Department of Forestry (DOF)

The Oregon Forest Practices Act recognizes, among other benefits, that Oregon forests provide habitat for wildlife and aquatic life, and declares it to be public policy "to encourage forest practices that maintain and enhance such benefits and such resources...". (Marshall, 1986).

The rules include requirements for reforestation and slash disposal, dictate harvest practices including stream and riparian protection, establish road location, and contain provisions for preserving "critical wildlife or aquatic habitat or the habitat of any wildlife or aquatic species classified by the Department of Fish and Wildlife as being rare or endangered. Such habitat could be nesting trees used by large birds of prey." (Brown, 1985; Marshall, 1986).

5. Division of State Lands (DSL) ,

In 1979, a natural heritage program was established by the Legislature. The State Land Board, through the Division of State Lands, administers the Natural Heritage Advisory Council. The Council seeks to preserve and coordinate the identification and establishment of natural areas representing the full range of Oregon's natural heritage resources, including special plant and animal species (Marshall, 1986).

As provided by statute, the Natural Heritage Advisory Council include? as part of the Natural Heritage Plan a list of special species. The list contains "animals and plants that would be of significant value in state natural heritage conservation (natural) areas." In reference to selection of areas, "Priority shall be based on the Natural Heritage Plan and shall generally be given to those resources and special species which are the rarest, most threatened or underrepresented in the heritage conservation system on a statewide basis." (Marshall, 1986).

The special species list is the only official list of species required by a state statute that includes animals that could be considered endangered species, although not by that term. The bald eagle is included on the special species list as priority two; species that could become extinct within 20-25 years throughout all or a significant portion of their range. The spotted owl is listed as a vulnerable species which is threatened with extinction in Oregon or throughout its range, or is especially sensitive to environmental disturbances (Marshall, 1986).

B. Federal agencies

A number of Environmental Laws and Executive Orders apply to Federal agencies with regulatory or management responsibilities for natural resources.

The Endangered Species Act of 1973, as amended, provides for the conservation of threatened and endangered species of fish, wildlife and plants by Federal action and by encouraging the establishment of state programs. It also requires Federal agencies to insure that any action

authorized, funded or carried out by them does not jeopardize the continued existence of listed species or modify their critical habitat (U.S. Department of Interior, 1979).

The Fish and Wildlife Coordination Act of 1934, as amended, requires consultation with the U.S. Fish and Wildlife Service and the wildlife agency of any state wherein the waters of any stream or other water body are proposed or authorized to be impounded, diverted, channelized, or otherwise controlled or modified by any Federal agency, or any private agency under Federal permit or license (U.S. Department of Interior, 1979). The Act directs equal consideration be given to wildlife conservation, and be coordinated with, other features of water resource development programs (Marshall, 1986).

The National Environmental Policy Act of 1969, requires all Federal agencies to consult with each other and to employ systematic, interdisciplinary techniques in planning and decision-making. They must prepare detailed "impact statements' for any action significantly affecting the quality of the human environment (U.S. Department of Interior, 1979).

The Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977 provide for a Federal permit and license system to control certain pollution discharge and fill activities in navigable waters (U.S. Department of Interior, 1979). An objective of the Clean Water Act (33 U.S.C., Section 1251, et. seq.) "is to restore and maintain the chemical, physical and biological integrity of the nation's waters."

Executive Orders 11990 and 11988 (of May 1981) direct Federal agencies to provide leadership in the avoidance, to the greatest extent possible, of the destruction and modification of wetlands and floodplains.

Executive Order 11989 of May 1981 directs the heads of Federal agencies to close public land areas to off-road vehicles whenever significant adverse impacts to public resources may be sustained.

1. USACE

The USACE, like the U.S. Bureau of Reclamation, is involved in the planning, construction and operational phases of major, multi-use water resource development projects. In addition, they have responsibilities in the areas of flood control and maintenance of navigable waters of the United States.

The USACE also administers Section 404 of the Clean Water Act that requires a permit for the discharge of dredge or fill materials into waters of the United States and associated wetlands. Such activities may be restricted if significant adverse impacts to fish and wildlife resources may result.

2. BLM

The Federal Land Policy and Management Act of 1976 (FLPMA) requires development and maintenance of land use plans based on an inventory of all public lands and their resources, places fish and wildlife management on an equal footing with other traditional land uses except for Oregon and California Railroad (O&C) lands,,-and authorizes the designation of areas of critical environmental concern to protect and prevent irreparable damage to fish and wildlife and other resources (Marshall, 1986).

The O&C Act of 1937 provides for multiple-use management of all revested O&C lands under the jurisdiction of the Department of Interior and classed as timber lands for permanent forest production and for the sale of timber. In 1983, the O&C Forest Resources Policy interpreted the Act as calling for O&C lands to be managed under provisions differing from other public lands. Under this policy, the primary management objectives for O&C lands are to manage for high level and sustained yield of wood products, and to provide for other land uses as established in the O&C Act and other legislation (Marshall, 1986).

The 1974 amendment to the Sikes Act of 1960 extended authority for wildlife program development from strictly military reservations to public lands administered by.USFS and BLM and was a mandate to plan, develop, maintain and coordinate programs for the conservation and rehabilitation of wildlife, fish, and game (Marshall, 1986).

The Secretary of Interior is required by the Taylor Grazing Act of 1934 to protect, administer, regulate, and improve grazing districts created in accordance with the Act (Marshall, 1986).

The BLM manual (BLM cited in Marshall, 1986) contains policies related to fish and wildlife which include the following:

> Develop and maintain wildlife and fish habitat at prescribed, sustained levels through coordination with all other uses of land or water to prevent significant damage to rangeland and forest wildlife and fish communities; to prevent and abate pollution; and to direct cultural or management practices.
>
> Cooperate with state wildlife agencies to ensure that wildlife and fish populations are maintained in balance with habitat capacity to preclude habitat ad other damage.
>
> Consult with the states and other organizations to determine the location and extent of existing habitats and those in need of improvement for various wildlife and fish species.
>
> Implement wildlife and fish habitat management measures in a manner that sustains ecosystem integrity, enhances the esthetic values, and preserves the natural environment.

Design habitat improvements and other management actions to protect threatened, endangered, and sensitive species and their habitats.

Give full consideration to maintaining habitat diversity for all wildlife and fish species with special emphasis on management of wetland and riparian areas.

Maintain habitat for viable, self-sustaining populations of cavity-nesting and snag-dependent wildlife species. This shall include the retention of selected trees, snags, and creation of new cavities, as well as selection of old-growth stands to meet habitat needs of wildlife dependent upon old-growth stands.

Maintain habitat for viable, self-sustaining populations of forest and rangeland wildlife. Special emphasis shall be placed on management and protection of wetland-riparian areas and other crucial areas, from competition with domestic livestock, wild horses and burros, or other uses which cause significantly adverse impacts on a long-term basis.

3. USFWS

The Endangered Species Act of 1973, as amended, directs USFWS to maintain the official U.S. list of threatened and endangered wildlife and plants, and enforce prohibitions on taking of endangered animals and issuance of regulations on taking of threatened animals where appropriate (Marshall, 1986).

The Fish and Wildlife Conservation Act of 1980 provides for financial and technical assistance to states for development, revision and implementation of plans and programs for nongame fish and wildlife (Marshall, 1986).

The USFWS operates 16 National Wildlife Refuges in Oregon and has a clear mandate from Congress to manage refuge lands for wildlife. Extraction of timber, grazing, and public use must not be counter productive to wildlife needs. Management practices such as farming, grazing, haying, and management of artificial water developments are practiced to enhance or maintain habitat for priority species (Marshall, 1986).

The USFWS utilizes a Mitigation Policy to guide service "recommendations on mitigating adverse impacts of land and water development on fish, wildlife, their habitats, and uses thereof." This policy identifies four Resource Categories of decreasing mitigation priority. The USFWS places considerable emphasis on wetlands protection and mitigation. In 1985, Region I adopted a Wetland Protection Policy which ensures a consistent regional approach in reducing net loss of wetland habitat.

4. USFS

The Forest and Range Renewable Resources Planning Act of 1974 requires development of national forest land use plans and, combined with the National Environmental Policy Act, requires USFS to delineate various

alternative timber harvest rates and other uses and determine their effects on wildlife, including nongame (Marshall, 1986).

The National Forest Management Act of 1976 1) provides for balanced consideration of all resources in the land management planning process on National Forest System lands 2) requires maintenance of vegetation diversity and native animal distribution on National Forest System lands 3) requires that fish and wildlife habitat be managed to maintain viable populations of existing native and desired non-native vertebrates in planning areas 4) requires establishment of lists of indicator species for each forest and establishment of objectives for their maintenance and improvement of habitat. Indicator species are those believed to indicate the effects of management activities 5) in cooperation with state fish and wildlife agencies, population trends of indicator species are to be monitored and relationships to habitat changes determined 6) places limits on size of clearcuts - 60 acres in Douglas fir-type forests and 40 acres in other Oregon types except in special circumstances, and 7) requires special attention be provided riparian areas including activities within 100 feet of riparian vegetation.

The Sikes Act as amended in 1974 is explained under BLM.

The Wilderness Act of 1964 requires USFS, USFWS, and National Park Service to review all roadless islands and roadless areas of 5,000 acres or more, under their respective jurisdictions for possible wilderness designation by Congress. The Act provides that designated wilderness and study areas be excluded from timber harvesting and remain roadless (Marshall, 1986).

The Forest Service Manual (USFS cited in Marshall, 1986) includes the following overall wildlife and fish habitat management objectives with respect to National Forest System lands:,

1. Develop and maintain, in cooperation with the states and in harmony with the natural environment and with other uses of the land, a pattern of wildlife and fish habitats on National Forest System lands that will best meet the needs of wildlife, fish, and people now and in the future.

2. Give special attention to the environmental needs of threatened and endangered animaland plant species, and establish as a goal their removal, where possible, from such status by improving, protecting, and managing their habitats.

3'. Give special consideration to species having state or Forest Service designation as sensitive in land use management planning and resource management programs.

4. Coordinate Forest Service resource management programming with the state strategies and wildlife management planning objectives.

Policy statements listed in the USFS manual (USFS cited in Marshail, 1986) include: 1) give coequal consideration to wildlife and fish

habitat with other resources in Forest Service programs 2) establish goals and objectives for wildlife and fish management, and incorporate habitat requirements consistent with these goals and objectives in all appropriate Forest Service plans, programs, and activities, as well as establish monitoring programs to ensure on-the-ground compliance 3) manage habitats that will, as a minimum, maintain self-perpetuating populations of existing species indigenous to specified land management units, and 4) protect and improve the status of threatened and endangered plant and animal species.

III. Policies, Goals, Standards by Habitat Type

A. Introduction

Habitat is the key to wildlife abundance (Brown, 1985). Wildlife professionals have acknowledged that a variety of habitats in stable supply must be provided to maintain a wide variety of wildlife species. But there are several factors working against retention of wildlife habitat diversity.

ODFW recognized the attrition of habitat was a serious threat to the maintenance of healthy and diversified populations of fish and wildlife (ODFW, 1983a). In its 1986 Nongame Plan (Marshall), ODFW enumerated many of the problems faced by wildlife managers affecting habitat and wildlife populations:

1) Habitat alterations or conversions due to changes in water regimes, such as diversions, impoundments, drainage, flooding, and irrigation.

2) The erosion or loss of habitat (especially aquatic ecosystems) from dredging, mining, and the extraction of sand, gravel, and rock.

3) The difficulty of maintaining adequate quantity, quality and distribution of older forest stands due to the harvest of remaining stands and short-term cutting cycles.

4) Salvage logging of snags and downed trees, fire suppression, and firewood cutting have complicated the maintenance of adequate quantities of snags and downed material representing a full range of sizes and decay stages.

5) Silvicultural conversions of hardwoods to softwoods impedes the maintenance of adequate quality, quantity; and distribution of hardwoods.

6) The quality and quantity of riparian areas and wetlands have been reduced by timber harvest operations that decrease the width and length of riparian zones, the conversion to conifers,' the disturbance of soil and ground cover during logging, importer grazing practices, and debris avalanches and slumps resulting from operations on steep slopes.

7) The presence and proliferation of forest roads, road construction activities, and improper road maintenance have caused a general habitat loss.

8) The reduction of wildlife habitats (especially aquatic ones) due to the conversion of wetlands, tidelands, riparian areas, forest, and agricultural land to housing, industrial or recreational sites, shipping terminals, airports, landfills, parking lots, transportation corridors, commercial services, and storage areas, etc.

9) Wetland drainage, filling, alterations, or activities on adjoining areas that cause a loss in water quality, soil erosion or changes in flow patterns disrupt the maintenance of an adequate quantity, quality, and distribution of wetlands.

B. Riparian Zones

Riparian zones and freshwater wetlands are among the most heavily-used wildlife habitats occurring 'in forest lands of western Oregon and Washington (Brown, 1985). 'Riparian areas and wetlands support more species of wildlife than any other plant community type and are used more intensively by wildlife than other portions of forest land (Stone and Carleson, 1983; Marshall, 1986).

Riparian zones occupy only a small part of the overall area, but are a critical source of diversity within the forest ecosystem. They create distinct habitat zones, and their elongated shape create a very high edge-to-area ratio (Brown, 1985). The vegetation, water, and topography of riparian ecosystems provide dense foliage, hollow trees, down wood, burrows, and dens for many species of wildlife (Carleson and Wilson, 1985). They have a high degree of connection with other habitat types and function as effective transport systems for water, soil, plant seeds and nutrients to downstream areas (Brown, 1985). Riparian habitats are important travel routes for the movement and dispersal of large and small wildlife (Brown 1985; Carleson and Wilson, 1985). Hard and soft snags found in riparian areas provide a variety of habitat niches for a substantial number of birds and animals. Down woody material is used for hiding, storing food, hibernating, and reproducing. Mature trees within the riparian area provide a variety of future snags, dead and down material, and valuable stream channel structure. The diverse plant species found in riparian zones provide a variety of habitat elements, including food, cover, and microclimate (Carleson and Wilson, 1985).

Riparian zones and wetlands provide some of the most important wildlife habitat in forest lands of western Oregon and Washington. Wildlife use is generally greater than in other habitats (Brown, 1985).

Management evaluation parameters for riparian habitat include: 1) stream surface shade 2) stream bank stability 3) streambed sentimentation 4j grass-forb cover 5) shrub cover, and 6) tree cover (ODFW, 1983b, 1985).

The buffer on each side of Class I streams should be an average of three times the stream width, but generally no less than 25 feet, nor greater than 100 feet (Carleson & Wilson, 1985).

Wetlands and riparian zones are habitats of special concern to ODFW (1983b). ODFW recommends 90 percent of the peripheral vegetation of wetlands be maintained one sight distance wide on forest lands, and two-thirds of the cover outside the periphery remain at all times in natural condition. Current acreage should be preserved (ODFW, 1985). ODFW recommends restoration of degraded riparian habitat on forest lands to at least 80 percent of potential (ODFW, 1985).

It is BLM policy to give full consideration to maintaining habitat diversity for all wildlife and fish species, with special emphasis on management of wetland and riparian areas (BLM cited in Marshall, 1986).

With regard to the Riparian Tax Incentive law, Oregon Revised Statutes state: The Legislative Assembly declares that it is in the best interest of the state to maintain, preserve, conserve and rehabilitate riparian lands to assure the protection of the soil, water, fish and wildlife resources of the state for the economic and social well-being of the state and its citizens. The Legislative Assembly declares that riparian habitat maintained in a healthy condition is a legitimate land use that contributes to erosion control, improved water quality and prolonged streamflow (ODFW, 1983-84).

Oregon Revised Statutes establishing the Willamette River Greenway state: The Legislative Assembly finds that, to protect and preserve the natural, scenic and recreational qualities of lands along the Willamette River, to preserve and restore historical sites, structures, facilities and objects on lands along the Willamette River for public education and enjoyment and to further the state policy established under ORS 390.010, it is in the public interest to develop and maintain a natural, scenic, historical and recreational greenway upon lands along the Willamette River to be known as the Willamette River Greenway (ODOT, 1976).

Goal 15, Willamette River Greenway, of Oregon's statewide planning program is: To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the, Willamette River Greenway (LCDC, 1985).

Riparian areas support more species than any other community types; 39 percent of birds and 50 percent of mamnals native to Oregon regularly use riparian habitat (Marshall, 1986).

Three of the 18 birds on USFWS 1985 sensitive biro species list are associated with riparian habitat: yellow-billed cuckoo, willow fly-catcher, Lewis woodpecker. (USFWS cited in Marshall, 1986).

Streamside buffer strips are designed to provide shade for 75 percent of the water surface of a stream. Streamside buffer zones for wildlife should, be wide enough and dense enough with natural undergrowth to provide protected travel routes for larger mammals and contain mature trees and snags to provide habitat, diversity (ODFW, 1983b).

Maintain 100 percent of 1975-85 estimated population levels for riparian, wetland, grassland, shrub and juniper steppe nongame wildlife species (Marshall, 1986).

C. Winter Range

Big game winter range is a habitat of special concern to ODFW (1983b). Because of competing land uses and human activities, winter range suitable for upland wildlife is not plentiful. This creates much greater wildlife density on winter range than on summer range, which limits the number of animals that can survive during the winter. Because of this, all areas considered to be winter ranges are valuable (Stone and Carleson, 19831.

Deer and elk prefer forage areas near cover. Cover areas are important to deer and elk because of modifications they make in microclimates. The animals are less subject to extremes in temperature, solar radiation, wind, humidity, rain and snow accumulation when in cover. It also reduces the. potential for predation and human disturbance (Brown, 1985). The older the forest stand, the more cover functions it provides. Old-growth stands are important to deer and elk during periods of deep snow because they provide cover with maintenance forage, and also during the summer when succulent vegetation in open clearcuts dries up (Brown, 1985). Deer and elk make greater use of, riparian cover especially during calving and fawning periods, dry summer months, and winters of heavy snow pack (Brown, 1985).

Forest roads increase public access that can disturb or harass deer and elk and reduce their use of otherwise suitable feeding and resting areas and preclude the use of some habitats for breeding and birthing. In some cases, roads create physical barriers (Stone and Carleson, 1983; Brown, 1985).

In the Cascades, winter ranges are generally the forest lands below 3,800-foot elevations on south slopes and 3,200-foot elevations on north slopes (ODFW, 1983b).

On the west slope Cascades, in addition to the above, each major drainage corridor in winter range will have a belt 1/4-mile wide on each side of the stream in optimal thermal cover (>21" dbh on approximately a 200-year rotation). Forage areas (clearcuts O-5" dbh) will not exceed 10 acres in size and will be well distributed throughout the drainage. A sustainable ratio of 50 percent optimal thermal cover, 25 percent thermal cover, 15 percent thermal shade (hiding cover) and 10 percent forage is recommended (ODFW, 1985).

D. Old-growth Conifer Forest

Old-growth forest is a habitat of special concern to ODFW (1983b). In western Oregon and Washington, approximately 500,000 acres annually are affected by timber harvesting operations (Brown, 1985). For the last 30 years, the annual loss and removal of Douglas fir sawtimber from western Washington and Oregon has averaged three times the annual growth. Overall, the trend has been toward greater deficit cutting (Harris et al. 1982). Except during the depression of the mid-1930's, the harvest in the Willamette National Forest has increased geometrically since World War I. Between 1935 and 1965, the annual rate of increase in the volume of cut was 4.7 percent. This has resulted in a doubling of the cut every 15 years (Harris et al. 1982). Generally, the pattern for clear-cutting is to begin at low elevations and proceed up the river valleys and terminate at high elevation sites where timber volumes are low. Because of lower volumes per acre, and because the average tree is progressively younger and smaller, the increase in acreage cut on the Willamette National Forest has been five times greater than the increase in volume during the last 40 years (Harris et al. 1982).

ODFW recommends a minimum of 5-15% of each major plant community in the forest be dedicated to old-growth stands; well distributed by slope, aspect, and elevation throughout the forest. Dedicated old-growth stands must include a sufficient amount and distribution of existing stands to maintain the existing populations of old-growth-dependent species. Managed old-growth stands will be in addition to, and not in lieu of, dedicated old-growth stands (ODFW, 1985).

Based on 1981 vegetation maps, about 25 percent of the Willamette National Forest remains in old-growth. Private industry has little old-growth remaining on its lands, and it is projected that old-growth will be liquidated from Bureau of Land Management lands within 30 years (Harris et al. 1982).

It is BLM policy to maintain habitat for viable, self-sustaining populations of cavity-nesting and snag-dependent wildlife species. This shall include the retention of selected trees, snags, and creation of new cavities, as well as selection of old-growth stands to meet habitat needs of wildlife dependent upon old-growth stands (BLM cited in Marshall, 1986).

With respect to National Forest System lands, USFS has management objectives to give special attention to the environmental needs of threatened and endangered animal and plant species, and establish as a goal their removal, where possible, from such status by improving, protecting, and managing their habitats‘(USFS cited in Marshall, 1986).

It is USFS policy to protect and improve the status of threatened and endangered plant and animal species (USFS cited in Marshall, 1986).

E. Snags

ODFW recommends a sufficient amount of habitat be provided to maintain cavity dwelling species at 100 percent of the population potential in areas managed especially for old-growth, old-growth species, and cavity-dwelling species. On the remainder of the forest, habitat should be provided to maintain cavity-dwelling species at or above 60 percent of the population potential (ODFW 1985).

Provision of sufficient snag habitat can be accomplished by maintaining about 22 dead trees per 10 acres, and a sufficient number of live trees to be converted into snags in the future (ODFW, 1983b).

Defined as a dead, partially dead, or defective (cull) trees at least 10" dbh and at least six feet tall (Brown, 1985).

Most hole-nesting birds have been shown to prefer snags with a dbh greater than 15 inches (Brown, 1985).

To support maximum densities' of pileated woodpeckers (a primary cavity excavator), six snags per 100 acres must be maintained at any given time (Brown, -1985).

Snags have an economic role in the forest ecosystem due to their importance to insectivorous birds such as woodpeckers. Insects annually cause tremendous economic losses to commercial forests (Brown, 1985).

F. Cliffs, Rimrock, Caves, and Talus

Caves, cliffs and talus are unique habitats that occupy a very small portion of the landscape but contribute significantly to the diversity of wildlife habitat found in the forest environment (Brown, 1985).

ODFW reconnnends use of management considerations in published guidelines to achieve maximum protection of these habitats on forest lands (ODFW, 1985).

Wildlife Management Activities

ODFW

Roosevelt elk trap and transplant program
Cascade Range elk radio collar monitoring
Seed and fertilize big game forage areas (often involving interagency cooperation)
Rocky Mountain elk emergency feeding stations
Green forage program
Bighorn sheep trap and transplant, and release program
Black bear radio collar monitoring
Beaver trap and transplant program
Willamette Valley Waterfowl Dispersal Plan
Waterfowl crop deferral
Waterfowl banding
Ring-necked pheasant rearing and release program
French red-leg partridge rearing and release program
Wild turkey releases
Nongame research contracts
Research Division
- Starkey Wildlife Management Unit elk study
- Antelope fawn survival study
- Western Oregon elk habitat.satellite imagery

County Land Use Planning process
Riparian Tax Incentive Program
Oregon Forest Practices Act revisions (in cooperation with DOF)
Wildlife Management Areas (18 statewide)

USFWS

National Wildlife Refuges
- Ankeny
- Baskett Slough
- William Finley

Bald eagle recovery plan (Interagency cooperation)

USFS

Wilderness Areas
Research Natural Areas
Experimental reservoir drawdown zone plantings
Reservoir drawdown zone seeding' and fertilizing (Interagency cooperation)
Spotted Owl Habitat Area (SOHA) preservation
Bald eagle nest management plans

USACE

Reservoir drawdown zone seeding and fertilizing (Interagency cooperation)

BLM

SOHA preservation
Bald eagle and osprey nest management

Appendix E: Tabular summary of potential mitigation sites and benefits to target species

Table 1. **Potential mitigation sites** and **benefits (Habitat Units)** to target **species, Willamette Basin,** Oregon.

Mitigation Site	Acres	Purchase/ nhancement costs ($\times 10^3$)	Percent of target species mitigation goal (%)																												
			Big Game[a]						Old-Growth Species						Riparian Species																	
			Elk			Deer			spotted Owl			Pileated Woodpecker			Beaver			River Otter			Wood Duck			fluffed Grouse			8-T Pigeon			Call?. Quail		
			C[b]	E[c]	P[d]	C	E	P	C	E	P	c	E	P	C	E	P	c	E	P	c	E	P	C	E	P	C	E	P	C	E	P
Winter Range (Purchase)																															
1. **Middle Santiam**	**2,600**	3,100	5	17	17	9	15	15	**Undet.**[e]			Undet.			2	2	5	3		610				:r[f]	1	3	**7**	**37**	**74**			
2. **Rumbaugh** Creek	1,220	1,100	3	**8**	**8**	3	7	7																4	5	11						
3. Three Creeks	**560**	409	2	4	4	2	3	3							1	1	1	1	1	2				tr	**tr**	tr						
4. Simpson Creek	**7,080**	**4,600**	**28**	42	46	25	37	41																tr	**tr**	1			100			
5. **Pioneer Gulch**	**1,640**	1,200	**6**	**9**	11	6	**8**	10																**tr**	tr	tr	19	24	47			
6. Blowout Creek	640	**800**	2	4	4	1	3	4							1	1	2	2	2	3	tr	1	4	tr	tr	1						
7. **Whitewater** Creek	**960**	1,200	3	6	6	3	5	6							tr	tr	1	1	1	2	1	1	2	tr	**tr**	**tr**						
8. **Long Ranch**	**60**	300			tr			tr																								
9. **Pigeon Prairie**																																
10. **Whitcomb** Creek																																
11. Grassy Glade																																
12. Green Butte																																
13. **Quartz** Creek																																
14. Stwbe																																
15. South **Santiam #** 1	86				1			tr																								
16. " " **#** 2	360				2			2																								
17. " " **# 3**	405				3			2																								
18. " " I4	143				1			1																								
19. " " **#** 5	**268**				2			2																								
20. Pamelia Creek	640				4			4																								
21. **Idanha #** 1	360				2			2																								
22. " **# 2**	**80**				tr			tr																								
23. " **# 3**	960				**6**			6																								
SUBTOTAL	**18,062**	12,700	49	90	117	49	78	105							4	4	9	7	1	017	1	2	6	4	6	16		**100**				
Riparian Habitat[g] (Purchase)																																
1. **Ingram/Morgan** Islands	275	412.5														6			11			14			2						9	
2. **Bowers** Rocks	300	450														7			12			15			3						10	
3. Hayden **Island**	270	**405**														6			11			14			2						9	
4. **American Island**	135	202.5														3			6			7			1						**5**	
5. **Jackson Bend**	**85**	127.5														2			4			4			1						3	
6. **Beacon Landing**	**335**	502.5														7			14			**17**			3						**11**	
7. **Kelzer** Bar	55	02.5														1			2			3			tr						2	
8. **Snaggy Bend Bar**	**85**	127.5														2			4			4			1						3	
9. **Lambert** Slough	35	52.5														1			1			2			tr						1	
10. **American Bottoms**	50	75														1			2			3			tr						2	
11. Candiani Island																																
12. **Five Island**																																
13. Grand **Island**																																
14. **Wheatland Bar**																																

Table E-1 (Continued)

Mitigation Site	Acres	Purchase/ Enhancement costs ($\times 10^3$)	Percent of target species mitigation goal (%)																					
			Big Game[a]						Old-Growth Species			Riparian Species									B-T Pigeon			Calif. Quail		
			Elk			Deer			spotted Owl			Pileated Woodpecker			Beaver			River Otter			Wood Duck			Ruffed Grouse					
			C[b]	E[c]	P[d]	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P
11. Forage seed & fertilize	per																														
a) Reservoir drawdown	1,000		1	2		1	2																								
b) Nat'l Forest clearcuts	acres		3	6		3	5																								
c) Private clearcuts			3	5		3	4																								
B) Riparian																															
1. Coalca (asphalt removal		10																													
2. McKenzie Is. (dredge)		5																													
3. Grand Island (reveg)		150																													
4. Lucklamute Landing (riprap)	,200 f	100																													
5. Yamhill Landing (riprap	,000 f	150																													
6. Elijah Bristow (reveg)		50																													
C) Old-growth																															
1. Purchase 4 yr. timber	per 1,000 acres	2,000								9			6																		
D) Wetland enhancement																															
1. Wiseman (Miller) Isl.	30-400																														
2. Green Peter (Corps)																															
a) Upper flats	10																														
b) Rumbaugh Creek	10																														
c) Thistle Creek, Sec 2	5																														
d) Thistle Creek, Sec 3	5																														
3. Foster (Corps)																															
a) Cool Creek	3																														
b) Sec 24	3																														
4. Fern Ridge (Corps)	800																														
E) Wetland purchase																															
1. Cox Butte	408	560																													
2. Richardson's Gap	1,200	2,400																													
3. Big Slash-Diamond K	2,000	2,000																													
4. Hedges Creek																															
5. Other sites Identified																															

[a] Based on elk mitigation goal of 15,295 HU's, deer goal of 17,254 HU's.
[b] Current (C) habitat value (%).
[c] Potential habitat value after enhancement (E) measures (%).
[d] Habitat value giving optimum value credit for purchase (P) (%).
[e] Undetermined benefits. Credit for "functional" old-growth habitat will be applied as stand conditions are identified.
[f] Trace (less than 1%).
[g] Costs of $1,500 per acre) mitigation credited as 1 acre = 1 HU.

Table 1 (Continued)

Mitigation Site	Acres	Purchase/ Enhancement Costs ($\times 10^3$)	Percent of target species mitigation goal (%)																					
			Big Game[a]						Old-Growth Species				Riparian Species											
			Elk			Deer			Spotted Owl			Pileated Woodpecker			Beaver			River Otter			Wood Duck			Ruffed Grouse			S-T Pigeon			Calif. Quail		
			C[b]	E[c]	P[d]	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P	C	E	P
15. Windsor Island																																
16. Independence Bend																																
17. Kentucky Bar																																
18. Tyson Island																																
19. Keesneck Lake																																
20. Santiam confluence																																
21. Lower Santiam Bar																																
22. Black Dog Island																																
23. Half Moon Bend																																
24. Irish Bend																																
25. Marshall Island, So.																																
26. McKenzie Island	235	352.5													5			10			12			2							
27. Pudding Creek	55	02.5													1			2			3			tr							
28. Fall Creek Confluence																																
29. Camas Swale	35	52.5													1			1			2			tr							
30. Coyote/Spencer Creek																																
SUBTOTAL	1,950	2,925													43			80			100			15						55	
Old-Growth Forest Habitat																																
1. Mary's River	250	1,000								4			3																			
2. Corvallis watershed	963									17			11																			
3. Detroit (SOHA)	760	1,520								13			9																			
4. N. Fk. Wilson River	400									7			5																			
SUBTOTAL	2,373	2,520								41			28																			
CUMULATIVE TOTAL	22,365	10.1 (million)	49	90	117	49	78	105		41			28		52			97			100+			31			100+			55		
Enhancement Options																																
A) Winter range																																
1. Groundhog Basin																																
2. Crabapple Prairie																																
3. Packard Creek																																
4. Paddy's Valley																																
5. Winberry Creek																																
6. Blanket Creek																																
7. Augusta Creek																																
8. Frissel Crossing																																
9. Nidden Lake Basin																																
10. School Creek																																

APPENDIX F: WILDLIFE SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE WILLAMETTE BASIN HYDROELECTRIC PROJECTS [1]

Herpt i 1 es

Northwestern salamander	Ambystoma gracile
Long-toed salamander	Ambystoma macrodactylum
Cope's giant salamander	Dicamptodon copei
Pacific giant salamander	Dicamptodon ensatus
Olympic salamander	Rhyacotriton olympicus
Clouded salamander	Aneides ferreus
Oregon slender salamander	Batrachoseps wrighti
Ensatina	Ensatina eschscholtzi
Dunn's salamander ,	Plethodon dunni
Larch Mountain salamander	Plethodon larselli
Western redback salamander	Plethodon vehiculum
Roughskin newt	Taricha granulosa
Western toad	Bufo boreas
Pacific tree frog	Hyla regilla
Tailed frog	Ascaphus truei
Red-legged frog	Rana aurora
Foothill yellow-legged frog	Rana boylei
Cascade frog	Rana cascadae
Bullfrog	Rana catesbeiana
Spotted frog	Rana pretiosa
Western pond turtle	Clemmys marmorata
Northern alligator lizard	Elgaria coerulea
Short-horned lizard	Phrynosoma douglassi
Western fence lizard	Sceloporus occidentalis
Western skink	Eumeces skiltonianus
Rubber boa ,	Charina bottae
Racer	Coluber constrictor
Sharptail snake	Contia tenuis
Ringneck snake	Diadophis punctatus
Gopher snake	Pituophis melanoleucus
Western terrestrial garter snake	Thamnophis elegans
Northwestern garter snake	Thamnoohis ordinoides
Common garter snake	Thamnophis sirtalis
Western rattlesnake	Crotalus viridis

Birds

Common loon	Gavia immer
Pied-billed grebe	Podilymbus podiceps
Horned grebe	Podiceps auritus
Red-necked grebe	Podiceps grisegena
Eared grebe	Podiceps nigricollis
Western grebe	Aechmophorus occidentalis

Birds (continued)

Double-crested cormorant	Phalacrocorax auritus
American bittern	Botaurus lentiginosus
Great blue heron	Ardea herodias
Great egret	Casmerodius albus
Green-backed heron	Butorides striatus
Greater white-fronted goose	Anser albifrons
Canada goose	Branta canadensis
Wood duck	Aix sponsa
Green-winged teal	Anas crecca
Mallard	Anas platyrhynchos
Northern pintail	Anas acuta
Blue-winged teal	Anas discors
Cinnamon teal	Anas cyanoptera
Northern shoveler	Anas clypeata
Gadwall	Anas strepera
American wigeon	Anas americana
Canvasback	Aythya valisineria
Redhead	Aythya americana
Ring-necked duck	Aythya collaris
Greater scaup	Aythya marila
Lesser scaup	Aythya affinis
Harlequin duck	Histrionicus histrionicus
Common goldeneye	Bucephala clangula
Barrow's goldeneye	Bucephala islandica
Bufflehead	Bucephala albeola
Hooded merganser	Lophodytes cucullatus
Common merganser	Mergus merganser
Ruddy duck	Oxyura jamaicensis
Turkey vulture	Cathartes aura
Osprey	Pandion haliaetus
Bald eagle	Haliaeetus leucocephalus
Northern harrier	Circus cyaneus
Sharp-shinned hawk	Accipiter striatus
Cooper's hawk	Accipiter cooperii
Northern goshawk	Accipiter gentilis
Red-tailed hawk	Buteo jamaicensis
Golden eagle	Aquila chrysaetos
American kestrel	Falco sparverius
Merlin	Falco columbarius
Peregrine falcon	Falco peregrinus
Prairie falcon	Falco mexicanus
Ring-necked pheasant	Phasianus colchicus
Blue grouse	Dendragapus obscurus
Ruffed grouse	Bonasa umbellus
California quail	Callipepla californica
Mountain quail	Oreortyx pictus

Birds (Continued)

Virginia rail	Rallus limicola
Sora	Porsana Carolina
American coot	Fulica americana
Sandhill crane	Grus canadensis
Killdeer	Charadrius vociferus
Greater yellowlegs	Tringa melanoleuca
Solitary sandpiper	Tringa solitaria
Spotted sandpiper	Actitis macularia
Western sandpiper	Calidris mauri
Least sandpiper	Calidris minutilla
Baird's sandpiper	Calidris bairdii
Dunlin	Calidris alpina
Long-billed dowitcher	Limnodormus scolopaceus
Common snipe	Gallinago gallinago
Wilson's phalarope	Phalaropus tricolor
Ring-billed gull	Larus califcrnicus
Western gull	Larus occidentalis
Black tern	Chlidonias nigar
Rock dove	Columba livia
Band-tailed pigeon	Columba fasciata
Mourning dove	Zenaida macroura
Common barn-owl	Tyto alba
Western screech owl	Otus kennicottii
Great horned owl	Bubo virginianus
Northern pygmy owl	Glaucidium gnoma
Spotted owl	Strix occidentalis
Barred owl	Strix varia
Great gray owl	Strix nebulosa
Long-eared owl	Asio otus
Northern saw-whet owl	Aegolius acadicus
Common nighthawk	Chordeiles minor
Black swift	Cypseloides nigar
Vaux's swift	Chaetura vauxi
Calliope hummingbird	Stellula calliope
Rufous hummingbird	Selasphorus rufus
Allen's hummingbird	Selasphorus sasin
Belted kingfisher	Ceryle alcyon
Lewis' woodpecker	Melanerpes lewis
Red-breasted sapsucker	Sphyrapicus ruber
Williamson's sapsucker	Sphyrapicus thyroideus
Downy woodpecker	Picoides pubescens
Hairy, woodpecker	Picoides villosus
White-headed woodpecker	Picoides albolarvatus
Three-toed woodpecker.	Picoides tridactylus

Birds (Continued)

Black-backed woodpecker	Picoides articus
Northern flicker	Colaptes auratus
Pileated woodpecker	Dryocopus pileatus
Olive-sided flycatcher	Contopus borealis
Western wood pewee	Contopus sordidulus
Willow flycatcher	Empidonax traillii
Hammond's flycatcher	Empidonax hammondii
Dusky flycatcher	Empidonax oberholseri
Western flycatcher	Empidonax difficilis
Western kingbird	Tyrannus verticalis
Horned lark	Eremophila alpestris
Purple martin	Progne subis
Tree swallow	Tachycineta bicolor
Violet-green swallow	Tachycineta thalassina
Northern rough-winged swallow	Stelgidopteryx serripennis
Bank swallow	Riparia riparia
Cliff swallow	Hirundo pyrrchonota
Barn swallow	Hirundo rustica
Gray jay	Perisoreus canadensis
Steller's jay	Cyanocitta stelleri
Scrub jay	Aphelocoma coerulescens
Clark's nutcracker	Nucifraga columbiana
American crow	Corvus brachyrhynchos
Common raven	Corvus corax
Black-capped chickadee	Parus atricapillus
Mountain chickadee	Parus gambeli
Chestnut-backed chickadee	Parus rufescens
Bushtit	Psaltriparus minimus
Red-breasted nuthatch	Sitta canadensis
White-breasted nuthatch	Sitta carolinersis
Pygmy nuthatch	Sitta pygmaea
Brown creeper	Certhia americana
Rock wren	Salpinctes obsoletus
Canyon wren	Catherpes mexicanus
Bewick's wren	Thryomanes bewickii
House wren	Troglodytes aedon
Winter wren	Troglodytes troglodytes
Marsh wren	Cistothorus palustris
American dipper	Cinclus mexicanus
Golden-crowned kinglet	Regulus satrapa
Ruby-crowned kinglet	
Western bluebird	Sialia mexicana
Mountain bluebird	Sialia currucoides
Townsend's solitaire	Myadestes townsendi
Swainson's thrush	Catharus ustulatus
Hermit thrush	Catharus guttatus
American robin	Turdus migratorius
Varied thrush	Ixoreus naevius
Wrentit	Chamaea fasciata

Birds (Continued)

Water pipit	Anthus spinoletta
Bohemian waxwing	Bombycilla garrulus
Cedar waxwing	Bombycilla cedrorum
European starling	Sturnus vulgaris
Solitary vireo	Vireo solitarius
Hutton's vi reo	Vireo huttoni
Warbling vireo	Vireo gilvus
Red-eyed vireo	Vireo olivaceus
Tennessee warbler	Vermivora peregrina
Orange-crowned warbler	Vermivora celata
Nashville warbler	Vermivora ruficapilla
Yellow warbler	Dendroica petechia
Black-throated blue warbler	Dendroica caerulescens
Yellow-rumped warbler	Dendroica coronata
Black-throated gray warbler	Dendroica nigrescens
Townsend's warbler	Dendroica townsendi
Hermit warbler	Dendroica occidentalis
American redstart	Setopphaga ruticilla
MacGillivray's warbler	Dporornis tolmiei
Common yellowthroat	Geothlypis trichas
Wilson's warbler	Wilsonia pusilla
Yellow-breasted chat	Icteria virens
Western tanager	Piranga ludoviciana
Black-headed grosbeak	Pheucticus melanocephalus
Lazuli bunting	Passerina amoena
Green-tailed towhee	Pipilo chlorurus
Rufous-sided towhee	pipilo erythrophthalmus
Brown towhee	Pipilo fuscus
Chipping sparrow	Spizella passerina
Brewer's sparrow	Spizella breweri
Vesper sparrow	Pooecetes gramineus
Savannah sparrow	Passerculus sandwichensis
Fox sparrow	Passerella iliaca
Song sparrow	Melospiza melodia
Lincoln's sparrow	Melospiza lincolnii
Golden-crowned sparrow	Zonotrichia atricapilla
White-crowned sparrow	Zonotrichia leucophrys
Harris' sparrow	Zonotrichia querula
Dark-eyed junco	Junco hyemalis
Red-winged blackbird	Agelaius phoeniceus
Western meadowlark	Sturnella neglecta
Brewer's blackbird	Euphagus cyanocephalus
Brown-headed cowbird	Molothrus ater
Northern oriole	Icterus galbula
Rosy finch	Leucosticte arctoa
Pine grosbeak	Pinicola enucleator
Purple finch	Carpodacus purpureus
Cassin's finch	Carpodacus cassinii
House finch	Carpodacus mexicanus
Red crossbill	Loxia curvirostra

Birds (Continued)

White-winged crossbill	Loxia leucoptera
Pine siskin	Carduelis pinus
Lesser goldfinch	Carduelis psaltria
American goldfinch	Carduelis tristis
Evening grosbeak	Coccothraustes vespertinus
House sparrow	Passer domesticus

Mammals

Virginia opossum	Didelphis virginiana
Vagrant shrew	Sorex vagrans
Dusky shrew	Sorex monticolus
Pacific shrew	Sorex pacificus
Water shrew	Sorex palustris
Pacific water or Marsh shrew	Sorex bendirii
Trowbridge's shrew	Sorex trowbridgii
Shrew-mole	Neurotrichus gibbsii
Townsend's mole	Scapanus townsendii
Coast mole	Scapanus orarius
Little brown myotis	Myotis lucifugus
Yuma myotis	Myotis yumanensis
Long-eared myotis	Myotis evotis
Fringed myotis	Myotis thysanodes
Long-legged myotis	Myotis volans
California myotis	Myotis californicus
Silver-haired bat	Lasionycteris noctivagans
Big brown bat	Eptesicus fuscus
Hoary bat	Lasiurus cinereus
Townsend's big-eared bat	Plecotus townsendii
Pallid bat	Antrozous pallidus
Pika	Ochotona princeps
Brush rabbit	Sylvilagus bachmani
Snowshoe hare	Lepus americanus
Mountain beaver	Apolodontia rufa
Yellow-pine chipmunk	Tamias amoenus
Townsend's chipmunk	Tamias townsendii
Siskiyou chipmunk	Tamias siskiyou
Yellow-bellied marmot	Marmota flaviventris
California ground squirrel	Spermophilus beecheyi
Golden-mantled ground squirrel	Spermophilus lateralis
Western gray squirrel	Sciurus griseus
Douglas' squirrel	Tamiasciurus douglasii
Northern flying squirrel	Glaucomys sabrinus
Botta's pocket gopher	Phomomys bottae
Western pocket gopher	Thomomys mazama
Beaver	Castor canadensis

Mammals (Continued)

Deer mouse	*Peromyscus maniculatus*
Dusky-footed woodrat	*Neotoma fuscipes*
Bushy-tailed woodrat	*Neotoma cinerea*
Western red-backed vole	*Clethrionomys californicus*
Heather vole	*Phenacomys intermedius*
White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Townsend's vole	*Microtus townsendii*
Long-tailed vole	*Microtus longicaudus*
Creeping vole	*Microtus oregoni*
Water vole	*Microtus richardsoni*
Muskrat	*Ondatra zibethicus*
House mouse	*Mus musculus*
Pacific jumping mouse	*Zapus trinotatus*
Porcupine	*Erethizon dorsatum*
Nutria	*Myocastor coypus*
Coyote	*Canis latrans*
Red fox	*Vulpus vulpes*
Gray fox	*Urocyon cinereoargenteus*
Black bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Marten	*Martes americana*
Fisher	*Martes pennanti*
Ermine	*Mustela erminea*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Wolverine	*Gulo gulo*
Badger	*Taxidea taxus*
Western spotted skunk	*Spilogale gracilis*
Striped skunk	*Mephitis mephitis*
River otter	*Lutra canadensis*
Mountain lion	*Felis concolor*
Lynx	*Lynx canadensis*
Bobcat	*Lynx rufus*
Roosevelt elk	*Cervus elaphus*
Mule deer	*Odocoileus hemionus*
Black-tailed deer	*Odocoileus hemionus*

[1] Based on species list for reproductive habitat, Willamette National Forest, BLM Unit Resource Analysis, and Oregon Nongame Wildlife Management Plan, review draft.

Appendix 6: Methodology for projecting elk production

The use of forage:cover ratios should be adjusted for local cover and forage requirements of deer and elk. The following example illustrates setting an objective for a subdrainage in the Cascades. The Oregon Department of Fish and Wildlife and the District Ranger agreed to a timber harvest objective that will provide forage and cover for 200 elk on the winter range.

Willamette National Forest data developed from forage production measurements (available, suitable, and utilized) indicate that elk utilize about 400 pounds of forage per acre per year in clearcuts. In optimal cover stands utilization is about 40 pounds, per acre per year (Harshman, 1972). Snow course data indicates that snow depths of two feet or more, persist an average of 20 days a year, out of a total winter period of 120 days. An estimate of the average daily consumption by an average size elk (of a family group) is about 10 pounds per day (pers. comm., H. Sturgis, ODFW, Corvallis).

Using these estimates, the biologists can calculate the acres of optimal cover (extended rotation) and forage acres (standard rotation) required to carry the 200 elk through the 120-day winter period.

The computations are:

(1) Optimal cover

(a) The elk would need about 1,000 acres of optimal cover (20 days of P-foot snow x 200 elk x 10 lbs. ÷ 40 lbs./acre = 1,000 acres).

(b) To provide the 1,000 acres in optimal cover, a-total of 2,000 acres would be needed in a 10:15:25:50 ratio; or 200 acres in forage (10 percent), 300 acres in thermal-shade (15 percent), 500 acres in thermal-minimum snow intercept (25 percent), and 1,000 acres (50 percent) in optimal cover.

(2) Forage areas

(a) The required forage acreage would be 500 acres (120 - 20 = 100 days x 200 elk x 10 lbs. ÷ 400 lbs/acre = 500 acres).

(b) Total forage and cover acres would be 2,500 (500/20 = total/ 100 = 50,000 ÷ 20 = 2,500 acre). Substituting back into the proposed ratio (20:30:50), there would be 500 acres of forage (2,500 x 20% = 500), 750 acres of thermal-shade (2,500 x 30% = 750), and 1,250 acres of thermal-minimum snow intercept (2,500 x 50% - 1,250).

Table 1: Forage:Cover Acre Calculations for a Herd of 200 Elk on Winter Range

	Forage	Cover[1]			Total
	Clearcut	TS	TMS12	Optimal	Acres
Optimal cover	200	300	500	1,000	= 2,000
Forage acres	500	750	1,250	0	= 2,500
Total acres	700	1,050	1,750	1,000	= 4,500

1 TS = Thermal Shade
2 TMSI = Thermal minimum snow intercept

Thus, the total acres for winter range to maintain an elk herd of 200 is 4,500 acres at the forage utilizations rate of 400 pounds per acre per clearcut and 40 pounds per acre for optimal cover. Changes in the rate of forage utilization or quality can increase or decrease the number of acres required or the number of animals produced.

This is a very simple example and it should be recognized that the 200 acres in forage provided in the optimal cover management area appear to be in excess, but as illustrated in the following calculations of the Habitat Production Index, there will be reductions in total forage acres.

This information is an excerpt from pages 46-48 of a paper written in 1986 by E. Harshman and R. Jubber. Copies of this paper, "Roosevelt Elk and Black-tailed Deer Guidelines for Western Slopes of the Central Cascades of Oregon", can be obtained from the Willamette National Forest office in Eugene.

Appendix H: Mitigation Opportunities Identified Along the Willamette River Greenway

The goal of the Willamette River Greenway is to protect, conserve, enhance, and maintain the natural, scenic, historical, agricultural, economic, and recreational qualities of lands along the Willamette River (ODOT, 1976). The Willamette River Greenway Plan provides for the preservation and, maintenance of existing farm lands, and places emphasis on public access to the river for recreational purposes. It also requires the' protection of significant fish and wildlife habitats, and the enhancement and protection of riparian vegetation along the river.

It is believed that the mutual goals of this mitigation plan, and those of the Willamette River Greenway plan, can be met by acquisition of riparian habitat along the main-stem Willamette River. Protection and enhancement of riparian habitat-within the Willamette Greenway boundary will prevent urban and agricultural development of these lands, retain a vegetative buffer zone along the river, facilitate bank erosion control, provide recreational access to the river, and preserve important wildlife areas. The State Parks Division of ODOT presently 'owns approximately 12,000 acres within the Greenway boundary, but for many years has had no fund allocated for purchase of additional parcels.

State Land Use Goal 15, the Willamette River Greenway, has been accepted into county land use plans and identifies riparian habitat as important to the State of Oregon. Because no alternate source of funding is available, this mitigation plan proposes the acquisition of private lands within the Greenway boundary for protection, enhancement, and mitigation of the losses sustained at the Willamette projects, consistent with the goals of-the Greenway plan. Public ownership of these lands will protect wildlife habitat, maintain a vegetative buffer, and preserve the integrity of the willamette River.

The following list of Willamette River Greenway parcels was'developed by ODFW and State Parks representatives. The selection criteria are summarized for each site. The following list in no way indicates the availability of the identified parcels; instead, it represents sites where the mutual goals of the Greenway plan and this wildlife mitigation plan can be met. Greenway properties may be purchased only from willing sellers.

Priority[a]	Site	River Mile	Acreage	Ownership	Comments
IA	Ingram Island	155	100	Private	Long bend in river, 1 mile of river frontage. Heavily vegetated with mature cottonwood. Long bar. Excellent deer habitat. Heronry, waterfowl. Nice upland, slough.
IB	Morgan Island	158	150-175	Private	Bend in river. Large stand of mature cottonwood and heavily vegetated banks. Open space. Vegetated bar is good deer and excellent beaver habitat. Adjacent slough provides good waterfowl resting area. Heronry.
					State Parks is interested in both sites as public recreation areas. There are no other state lands close by, access is good for maintenance of recreation facilities. State Parks would like to acquire farmlands on Morgan Island and puts higher priority on this site. Both islands are similar for wildlife values, but ODFW puts priority on Ingram Island because of the heronry. Both islands have the potential to fulfill the needs of both agencies.
2	Bowers Rocks State Park	122	400	State Parks, private	This site is of very high priority to State Parks because it is identified in the Greenway Plan as one of five regional parks. State Parks wants to acquire inholdings and expand their ownership, primarily 200 acres of upland farmland and gravel operation. A 20-acre pond will eventually be available when the gravel operation is ended. There is good public aupport in the Albany area for the regional park. ODFW is primarily interested in 200 acres of riverfront property where a heron rookery is located. To satisfy the needs of both agencies, the full 400 acres would have to be purchased.
3	Hayden Island	BB	270	Private	Mature deciduous trees, thick brush, open space, water inlets. Heron rookery. Various species of wildlife found here. Warm water fishery. Prime site for State Parks. Lot of power boat use in this area of the river. Significant gravel values at this site could make it difficult to obtain. Has value to both state agencies as one of largest contiguous pieces on the river.

[a] Sites 1 through IO are ranked in order, the moderate and low priority sites are not ranked.

Priority[a]	Site	River Mile	Acreage	Ownership	Comments
4	American Island	147	134	Private	Heavily vegetated with mature cottonwoods. Willow bars. Open spaces. Very large slough borders backside of area, provides excellent habitat for summer-resident waterfowl. Heron rookery. Very high value to ODFW. The site is not really suited for camping and has poor access for maintenance operations. There are public access areas nearby, which reduces the recreational value of this site to State Parka. State Parks aupports purchase of this site as a low maintenance natural area for aesthetic purposes.
5	Jackson Bend	64	86	State Parks, private	Scenic slough in natural state with potential warm water angling. Surrounded by tree-covered bluff on one side, and submersible land abundant with willows and cottonwoods on the other aide. Great blue heron rookery. Furbearer and waterfowl rearing area. Of high value to both state agencies. Slough is navigable, and area has potential for hiking. Significant gravel values and proposed gravel mining operation could make this site difficult to obtain.
6	Beacon Landing	172	335	Private	Two large islands and large upland slough. Mature cottonwoods dominate scenery, with younger willows in foreground. Small, open bars along steep or heavily vegetated bank. Several open spaces. Abundant use by beaver. Heron rookery. Good trout angling. Islands, channels and sloughs create a lot of water edge. Large anount of beaver habitat. Overall excellent wildlife habitat; however, maintenance would be difficult from a recreational point of view. Jhere are other general use public lands in the area. This site could be maintained by State Parks as a primitive area.
	Keizer Bar	81	54	Private	Old gravel pit. Currently for sale. High priority for State Parka - would tie in to Wallace Marina with a trail. County would take over park maintenance. Ten acre pond provides excellent warm water fishery. Site of moderate value for wildlife mitigation. Located across the river from downtown Salem.
B	Snaggy Bend Bar	67	85	Private	Cottonwoods, blackberry understory. Open areas. Slough. Gravel bar. Island for part of the year. For sale now. Land parcels are on both sides of the river. Lower priority to State Parks because of state ownership in area.

Priority[a]	Site	River Mile	Acreage	Ownership	Comment 8
9	Lambert Slough	65	37	Private	Scenic and natural area downstream of Lambert Slough has deciduous trees, willow, and brush. Various wildlife species found here. Waterfowl use. Excellent warm water angling. Of high value to wildlife. This site would tie in nicely with State Parka Lambert Bend property, but is of lower priority because of the nearby public lands.
10	American Bottoms	101	50	State Parks, private	Heron rookery located below Sidney landing. Low lying deciduous vegetation: cottonwood and ash. Some channels. State Parke owns orchard at south end; will support site as primitive area.
Moderate	Grand Island	68	140	State Parks, private	Wooded area in natural state. Deciduous trees, grass, brush. Waterfowl and various species of wildlife found here. Old heronry. Lower priority to State Parke because of state ownership in area.
Moderate	Windsor Island	75	72	Division of State Lands, private	Old river channel presently covered with deciduous trees and brush. Active heronry, furbearer use. Excellent warm water angling. Sand and gravel lease through 1988. Lower priority for State Parks because of public lands in area. May be able to negotiate protection of heronry with State Lands. Site is of high value for wildlife due to heronry .
Moderate	Independence Bend	94	147	Private	River bend. Open space surrounded by deciduous trees, willows. Old heronry site. Sloughs. Landowner logged one third of area in protest of Greenway. Power boat use on this stretch of river. Limited public ownership in area, not much demand for publ ic access to river in this area. Lower priority for State Parke. Moderate value for wildlife.
Moderate	Half Moon Bend	127 ,	113	State Parke, private	Gravel extract-ion area surrounded by mature stands of cottonwood, maple, and ash. Plenty of open space. Vegetation in area provides good habitat for many bird species and small mammals. Waterfowl use. Moderate value to State Parks because it's close to other state lands, but it would make a nice addition to the existing state lands on the other half of the bend. Popular boating stretch of the river, with a lot of public access to the quarry site. Parking lot, trails,

Priority[a]	Site	River Mile	Acreage	Ownership	Comments
	Half Moon Bend (continued)				and primitive campsites are likely parks enhancement propoaale. Site is of moderate value to wildlife because of existing state lands on both sides of the river. In the Future, when the gravel operation is ended, the site will be of high value to wildlife.
Moderate	Irish Bend	151	106	Private	Near Irish Bend County Park. One mile of river frontage with willow bare. Open space. Mature cottonwood and maple dominate the back-ground view. The slough has a good warm water fishery. Fall chinook spawn along the gravel bar. Lower priority for State Parka because of proximity of public lands and maintenance problems. Support purcheae of site as natural area. Value to wildlife leas than priority sites.
Moderate	Fall Creek Confluence	198-200	268	State Parka, private	Thin strip of land above Fall Creek Confluence is a mixture of conifer and cottonwood along upper portion, and willow-type vegeta-t ion downriver. Island heavily vegetated with mature cottonwood and some cedar, with a heronry. Heavily wooded area on left bank of young and mature cottonwood; excellent deer habitat. State Parka supports acquisition of 50 acre parcel adjacent to state lands, since it would make little change in their maintenance operations. Value to wild-life moderate overall with regard to adjacent public lands.
Low	Candiani Island	58	67	BLM, State Lands, private	River bend on right bank with cottonwoods and willow. Heronry. Fur-bearer and waterfowl rearing area. OF lower value for acquisition to both State Parks and ODFW because it is an island of primarily public ownership.
Low	Five Island	62	86	Private	Acreage includes island and adjacent upland. Deciduous trees, grass, and brush. Heronry, Furbearer and waterfowl rearing. Good wildlife area, but similar situation to Candiani Island.
Low	Kentucky Bar	97	89	Private	Bend in river with mature deciduous tress and willow ground cover. Heronry. Valuable to many species of wildlife, but of lower value compared to Hayden Island because it is a smaller island and disturbance of grave1 operation. Lower priority for State Parke because of state land across the river, and erosion problems.

Priority[a]	Site	River Mile	Acreage	Ownership	Comment a
Low	Keeaneck Lake	104		Private	Not known if heronry still exists. OF lower value because of farming. Of value to State Parks For aesthetic purposes across the river from American Bottoms.
Low	Santiam Confluence	108	19	State Parks, private	Cottonwoods and open spaces. Heronry. OF lower value to State Parke because of large amount of state ownership in vicinity and water fluctuation, but support purchase of site For aesthetics. Nice area For wildlife, but of lower value overall compared to other aitee.
Low	Upper Santiam Bar	109	135	Private	Willow bare along 1.5 miles of river Frontage. Mature cottonwood with'ecattered open spaces. Excellent deer and beaver habitats, small heron rookery. Lower purchase priority For same reasons as Santiam Confluence.
Low	Black Dog Island	111	61	State Lands (?), private	Heavily vegetated with mature cottonwood. Has a heron rookery, as well as habitat for small mammals and birds. Lower value For wildlife acquisition. Part of island already in public ownership.
Low	McKenzie Island	174	235	State Parka, private	Large island at the confluence of the McKenzie River. Heavily vegetated with cottonwood, ash, maple, and some conifer. Bank generally steep and thickly covered. A Few bar areas. Several open areas. Abundant use by Furbearers and deer. Excellent habitat for songbirds and shore birds. Large heronry. Nice parks posaibilit iea, but difficult to maintain. Other state lands close by. OF high wildlife value, but of lower priority because of significant gravel values. State Parke supports purchase as a natural area.
Low	Pudding Creek	191		Local government, private	Large heronry. Site has been cutover. Of low purchase priority to State Parke.

Appendix I: Selected Timber Sales for Old-growth Douglas Fir Showing Price Fluctuations Over a Ten-year Period.

Sale Name	Vol./ Acre:BMF	Bid Price /MBF	Value Per Acre	Date of Bid
Knobby	58	$364	$21,112	3/77
Perdue Leave	64	$340	$21,760	3/78
Bar	85	$467	$39,695	4/79
Boomer	105	$445	$46,725	4/79
Ranger Leave	85	$567	$48,195	4/81
Roughshod	52	$126	$ 6,552	9/82
Cornpatch	55	$285	$15,675	3/83
Upper Salmon	71	$141	$10,011	10/84
Cayuse	55	$173	$ 9,515	10/84
McChalk	74	$195	$14,430	1/85
Black Saddle	93	$175	$16,275	1/85
Lower Bunch	52	$166	$ 8,632	2/85
Shady Creek	61	$ 75	$ 4,575	3/85
Saddle Sore	82	$170	$13,940	6/85
Mid Hopper	58	$133	$ 7,714	8/85
Warble Ridge	52	$160	$ 8,320	9/85
Etta Prairie	107	$141	$15,087	9/85
Captain Creek	41	$ 91	$ 3,731	3/86
Squaw Slope Resale[1]	63	$175	$11,025	8/86
Hard Indian Resale	64	$150	$ 9,600	9/86
Buffalo Bill #2 TBV	58	$137	$ 7,946	10/86
Border	103	$272	$28,016	2/87

[1] The Squaw Slope resale was defaulted and resold. This sale was first sold in 6/78 for $375/MBF ($23,625/acre).

(Pers. Comm., T. Bailey, Resource Planner, USFS, 14 April 1987, Oakridge, OR.).

Appendix J: Comments on Draft Report, and Responses:

Page

J1-1 USFS Letter
J1-7 Response

J2-1 USACE Letter
J2-10 Response

J3-1 USFWS (May 1) Letter
J3-3 Response

J3-5 USFWS (March 26) Letter
J3-13 Response

MAR 24 1987

United States Department of Agriculture | Forest Service | Willamette National Forest | 211 East 7th Avenue Eugene, OR 97401 (PO Box 10607 97440)

Reply To: 2630

Date: March 20, 1987

Mr. James R. Meyer
Wildlife Program Area Manager
Bonneville Power Administration
Box 3621
Portland, OR 97208

Dear Mr. Meyer:

1 The Willamette National Forest is grateful for the opportunity to respond to the Draft Report, "Wildlife Habitat Mitigation Plan at Federal Hydroelectric Facilities Wiliamette River Basin, Oregon," prepared by Oregon Dept. of Fish and Wildlife.

2 As one of the organizations participating in the multiphase process culminating in the creation of the mitigation plan, the Forest is extremely interested in having a thorough, easily understood, and defensible product;

3 The Forest response is organized in four sections that deal with areas or concepts we strongly support, specific items that appear to need correction, areas or concepts that need further clarification, and significant points that still need to be addressed in the plan.

4 The stepwise process by which species specific habitat losses were identified and condensed to the critical habitat types that then were used to drive the mitigation plan provides an easily understood justification for implementing the plan. Agencies, administrators, ratepayers, and critics should all be able to grasp the basic thought processes and be able to relate to the three basic habitat types of winter range, riparian habitat and old growth.

5 The active involvement of all the resource management agencies at all steps of' the process provides the mitigation plan with the firmest foundation and broadest support possible. Mutual ownership of the product should encourage continued enthusiastic support as the implementation phase begins. The Forest believes recognition of the multiagency commitment to the production of this plan should be well documented and acknowledged in I. Introduction.

6 In several locations, the mitigation plan notes the "priority mitigation objective" is to replace big game winter range. The Forest fully supports winter range replacement as a priority objective in the plan. To make that fact abundantly clear, a table in section III. C. Planning Process should establish the hierarchy of objectives that drive the entire process. In that way, interested readers could discern the relationships from which decisions were made throughout the mitigation plan.

7 The decisions to place highest priority on purchase of private timberlands within or adjacent to public lands and to distribute sites throughout the study area (decisions 6 and 7, page 18) have strong Forest support. Without exhaustive studies of carrying capacities of the winter ranges and the summer ranges necessary to support the herds, distributing the improved habitat reduces the risk of creating an imbalance, spreads the populations over more **huntable** area, and preserves future options.

8 Location of the acquired habitats adjacent to existing public lands is advantageous for several reasons: a variety of land and resource management skills are available and can be used efficiently; the acquired habitat management objectives can be coordinated with those of the existing public lands; fire protection, road maintenance, and management of public use can be part of existing area-wide programs; and long-term management strategies can be vested in agencies that are accustomed to such timeframes for management.

9 The immensity of the task undertaken in an overly short time period while lacking an established **roadmap** may explain the need to make some corrections to the text of the report.

10 On page 7, paragraph **1,** the reference to shorebirds needing shoreline cover is inappropriate and should be deleted.

11 On page 7, paragraph 3 creates several false impressions. The zones where seeding is appropriate are always exposed early enough to make seeding successful and have not been abandoned since the project became accepted as a worthwhile activity. The sedge plantings are limited by availablity of funds and sedge sod. Although tolerance to flooding may be the ultimate determinant of sedge distribution in the **drawdown** zone, it has yet to be demonstrated.

12 Off road vehicle use of **drawdown** zones is an established fact, but **to** attribute plant damage and wildlife disturbance to the activity is fairly speculative and, along with reference to access control, should be deleted.

13 The discussion of elk population goals on page 11 is disjunct and needs to be shown in a single table. The summation of the Willamette National Forest, BLM Santiam Planning Unit, McKenzie and South Valley goals should adequately represent that all agencies are supportive of herd levels considerably higher than currently exist. Current evaluations suggest summer ranges are not fully utilized and technology exists to increase summer range productivity while also assuring increased animal densities do not adversely impact reforestation.

14 On page 11, paragraph 2, and page 12, paragraph 3, the optimum thermal cover recommendation of **1/4** mile on each side of ***major*** streams is unachievable. For

the Willamette National Forest, there are approximately 2 stream miles per square mile of winter range. A 1/2 mile band along each mile of stream would equate to the entire winter range being in optimal thermal cover.

15 If winter range is of special concern, unit size should reflect temperature needs in preference to forage areas. Recent research indicates 30 acres as the minimum size unit offering adequate thermal protection. The Forest believes 30 acre units are more appropriate unit size for habitat manipulation based upon a greater than 60 percent utilization of the center of unit (Brown, et al 1985).

16 The Forest agrees with the need for a 50-30-20 ratio of thermal-hiding-forage on summer range but not the need for one half of the summer range thermal cover to be in optimal condition. Since summer range is not germane to the mitigation plan, the subject should be deleted.

17 Forest Service draft management goals for pileated woodpeckers (page 15, paragraph 3) are: maintenance of a minimum of 119 habitat areas consisting of 300 acre mature/old growth timber types.

18 Forest Service draft management goals for spotted owls (page 16, paragraph 2) are: a minimum of 78 habitat areas of approximately 2200 acres each, evenly distributed throughout the Forest.

19 The Forest believes the bald eagle management goals paragraph (page 16, paragraph 3) does not adequately credit Lowell Ranger District and Rigdon Ranger Districts for their efforts producing and administering the Crale Creek Bald Eagle Management Plan and the Hills Creek Reservoir Bald Eagle Management Plan respectively.

20 The Forest is concerned that table 2 carries incorrect costs for acquisition of certain habitat types, incomplete display of riparian and old growth habitats associated with winter range sites 9-22 and, extraneous information. The Forest believes this table should be disaggregated, expanded upon, and limited to the direct mitigation opportunities.

21 Throughout the mitigation plan the Forest feels the estimated land acquisition costs for old growth are abnormally high, which in turn inflates project costs to unacceptable levels. Actual costs should be verified as soon as possible through market data analysis.

22 The complexity of the task of developing mitigation measures over distance and varying habitat types while dealing with a whole new set of management scenarios generates a need to clarify several items.

23 There is a need to discuss the implications of changing forestry-driven to wildlife-driven management on key winter range.

24 There should be a discussion of the technological needs associated with managing timber lands specifically for wildlife and the role of adaptive management in finessing treatments to maximize benefits.

25 The expected benefits to be derived from transferring riparian habitat goals to Willamette Greenway acquisitions need expansion and clarification. What are the key habitat characteristics being sought? What selection criteria will be used to rank prospective sites? What benefits are expected to be derived by converting current ownerships to public ownerships? What types of "improvement" activities are expected and what are the costs? Who will be responsible for management and protection of the acquired sites? The information provide on page 77 does not indicate a priority for acquisition or active management of wildlife habitat. More detailed strategies must be established and commitments secured before this plan can be brought to fruition.

26 It should be recognized that in block acquisitions of land, there are going to be significant areas that can only have marginal wildlife values no matter how treated (steep slopes, northerly aspects, etc.). Where these lands can be managed for their timber production potential, it should be recognized and the revenues derived from intensive silvioulture should be used to'defray fire protection, road maintenance and wildlife improvements in the adjacent areas.

27 There is a need for a dispassionate description of the management scenario or scenarios by which second growth timber would be treated to accelerate the aging process to create a specific habitat condition at an earlier chronological age. There also needs to be a discussion of the probable locations of these treated lands to meet some reasonably strategic distribution of future habitats for old growth obligate species. Again, a discussion of technology development needs and opportunities for adaptive management needs to be developed.

28 Alternative 2 (page 40) does not adequately represent the concepts for satisfying the old growth goals presented by the Forest at the January 8, 1987, coordination meeting. First, we agree that 1,228 acres of functional old growth occur as a part of the key winter range acquisition. Second, we agree that finding valued old growth habitats is difficult and that few, if any, are really available. However, we believe the proposed plan should be flexible enough to acquire suitable sites should they be recognized and justified. The remaining unsatisfied portion of the goal should be met by acquisition of second growth timber stands that would then be subjected collectively to management in a manner that would lead to continuing supply of habitat for obligate old growth species into the distant future.

29 The basic premise in this concept is that old growth is only a stage in the successional process and that active management is necessary to extend the timeframe of the desired habitat conditions typical of the old growth period. Within this concept a certain amount of revenue will be gained as a result of treatments to accelerate or decelerate the aging process. These revenues should be dedicated to paying fire protection, road maintenance, or habitat manipulation costs, and by doing so should reduce the need for future maintenance funds from Bonneville Power Administration.

30 With the recognition that the mitigation plan is highly conceptual and that a detailed implementation plan will be necessary, there are several items the Forest believes should be addressed in this plan.

31 Implementation of the plan will significantly impact adjacent landowners, local governments, and the providers of necessary services.

32 Acquisition of specific blocks of land and changes to their utility will have major effects upon adjacent iands. Management plans will'need to recognize the normal behavior of the animals and management prescriptions will need to be developed accordingly to maximize Compatibility. In some cases, acquired lands will need to be managed at less than maximum output of wildlife until improved technology allows conflicts to be resolved.

33 Implicit in the management of forest lands are fire protection, maintenance of roads, bridges and other improvements, incidental uses, and recreation.

34 There are frequently also opportunities to improve the utility of the land without adversely affecting the outputs for which the land was originally acquired. The mitigation plan should recognize the need for developing a holistic management plan for each significant acquisition and propose a mechanism by which interested parties would have input.

35 The mitigation plan should discuss the implications of these activities, their costs, and recommend mechanisms for securing needed services. The Forest believes it is the logical provider of management and services on those proposed acquisitions within or adjacent to Forest boundaries. Through existing mechanisms, actual ownership could be transferred to the USDA Forest Service and integrated with management of surrounding lands. Covenants on the title and specific allocation within the Land and Resource Management Plan are adequate to protect and maintain the unique purpose for which the original acquisition was made.

36 In the course of long-term management of the land, considerable revenues should begin to be generated, especially after the third and fourth decades. The mitigation plan should specifically identify that fact and discuss the ramifications of: (1) using it in lieu of taxes to the counties, (2) using it to cover manipulation and maintenance fees, (3) using it to make future acquisitions, and (4) allocating it to Bonneville Power Administration as a return-on-investment.

37 At several of the reservoir projects, the US Corps of Engineers has retained ownership of significant acreages above high pool level. Although the mitigation plan recognizes the potentiai for treatment of reservoir drawdown zones (table 2, page 27) it fails to recognize the availability or feasibility of improving wildlife benefits on the currently existing project lands. The Forest believes the mitigation plan should Incorporate these available lands as a high priority to treat in mitigation for project impacts.

38 Public acceptance of the mitigation plan is an absolute necessity before it can be adopted and implemented. Although difficult to do, the mitigation plan should address interests and concerns of three general publics: (1) county governments must be shown how loss of revenues by converting private lands to public ownerships is to be offset, (2) timber interest groups must be shown how future yields will be affected by converting lands from a timber emphasis to wildlife emphasis, (3) wildlife interest groups must be shown how managing the

acquired lands will be to the benefit of wildlife, and (4) the general public must be shown why it is in their best interest to invest substantial amounts of money to convert management from one emphasis to another.

39 The Willamette National Forest appreciates the opportunity to provide the preceding comments regarding the Willamette Basin Mitigation Plan and hopes they are accepted in the positive sense in which they are offered.

40 The involvement of the USDA Forest Service in this very significant and worthwhile project has been an interesting and worthwhile experience. The Forest looks forward to assisting the preparers in incorporating the proposed changes into the mitigation plan. Ultimately, we anticipate its acceptance by Bonneville Power Administration, adoption by the Northwest Power Planning Council, and implementation by the several involved agencies, including the Willamette National Forest.

Thank you again for the opportunity for involvement.

Sincerely,

MICHAEL A. KERRICK
Forest Supervisor

cc: Oregon Dept. of Fish and Wildlife
Salem District, Bureau of Land Management
US Fish and Wildlife Service
Portland District, US Corps of Engineers
Northwest Power Planning Council
Region 6, USDA Forest Service

25DS66SL

Response to Specific Comments: USFS

Pg. 1, P.1 5

Multi-agency participation and consultation is well- documented throughout the report, including Appendix A.

Pg. 2, P. 6:

No heirarchy of the decisions listed in Section III.C was established, hence such a table is not possible. The decisions identified on pg. 19-20 were made in response to a variety of concerns and information. For example, the decision to make replacement of big game winter range a priority objective was based on the information that almost half (49 percent) of the impacted habitat was equivalent to general purpose big game winter range (see Section III.D), and 100 percent of the loss was effectively critical big game winter range. On the other hand, the decision to credit functional old-growth at 90 years-of-age, was totally arbitrary. These decisions are interrelated with each other, not heirarchical to each other.

Pg. 2, P. 8:

The intent of locating mitigation lands in proximity to existing public lands is, primarily, to maximize the habitat benefits to wildlife, avoiding the problem of isolated pockets, or islands of habitat. This inherently considers the advantages of coordinated management plans, and mutually compatible objectives. The long-term management strategy will be specifically delineated during the implementation phase, based on the objectives of this mitigation plan. Subsequently, we are unclear as to the agencies referred to in this paragraph and the relevance to this mitigation. plan.

Pg. 2, P. 10:

We have modified this reference to clarify the concept (pg. 7, P.2). Lack of shoreline cover is a disadvantage for many species.

Pg. 2, P. 11:

This section has been rewritten (pg. 7-8) and includes the most recent information available to us.

Pg. 2, P. 12:

As note, on pg. 7, last paragraph, neither the plant damage nor the access-control difficulty is speculative in nature. This may or may not be a problem in the future.

1 Paragraph

Pg. 2, P. 13:

The discussion on pg. 11-13, clearly shows elk population goals for OOFW, USFS and BLM have not been met.

Pg. 2, P. 14:

As noted on page 12 of this report, these guidelines from ODFW are specific to the Cascade Range and were submitted for incorporation into the Forest Planning Process. The USFS reviewed these recommendations in March of 1985, and were submitted, along with statewide guidelines, to the appropriate National Forests. Considering we can attain only approximately 585 acres (16.3 miles) of riparian habitat on 20,000 acres of representative key mitigation sites (Section III.D), we are unclear as to the reference in this paragraph.

Pg. 3, P. 15:

We feel this paragraph confuses the idea of a 30-acre stand of timber and a 30-acre clearcut in regard to [elk] utilization of the center of the unit. A reference list was not provided, but we assume Brown et al. 1985, refers to Management of Wildlife and Fish Habitats in Forests of Western ego on referenced in this document. This statement is inconsistent with information on page 298 (Brown et al. 1985) that the maximum circular clearcut unit is 26 acres (i.e., 1,200 feet in diameter) that will sustain 95 percent of deer and elk use, but that rectangular clearcut units can provide maximum use on a much larger area (e.g., 1,200 feet wide by 3,000 feet long = 84 acres). The size of the clearcut dictates the size of the thermal cover area 90+ years later, which should take into account.various site considerations.

Pg. 3, P. 16:

See response for comment on pg. 2, P. 14 (J1-7). Refer to page 12, paragraph three of the report.

Pg. 3, P. 17: Included under pileated woodpecker, pg. 16 of this report.

Pg. 3, P. 18: Included under spotted owl, pg. 16 of this report.

Pg. 3, P. 19: Clarified on pg. 17, under bald eagle, in this report.

Pg. 3, P. 20:

All costs in this report have been re-evaluated and revised since the draft report. Cost information was obtained, principally from either Willamette Forest or Region 6 (USFS) personnel. Table 2 and Appendix E must remain general, by necessity, because they display only potential opportunities.

Pg. 3, P. 21:

A market data analysis is not within the scope of this study. Old-growth forest costs are extremely difficult to generalize about, and, according to USFS personnel, have created difficulties in the Forest Planning process as well as in the present mitigation planning effort. To illustrate the fluctuations in the cost of mature Douglas fir timber, we have included Appendix I.

Pg. 3, P. 23:

We are unclear as to the point of this statement. This report includes discussions on the "boom or bust" habitat phenomenon, and the impact on wildlife pertinent to large-scale even-aged timber management (pg. 63-64); the need 'for a sacrifice in timber revenues to provide good wildlife management and the lack of incentive for this approach on private lands (pg. 63); and a generic management plan, for representative key mitigation sites, that emphasizes wildlife habitat (Section IV.A.8, pg. 51).

Pg. 3, P. 24:

The intent of this plan has been to maximize habitat benefits to wildlife (e.g., locating representative mitigation sites near public lands). The generic management plan (Section IV.A.8) provides a range of potential management opportunities. More detailed management discussions would have to be applied to specific mitigation properties and would include consideration of the factors listed on page 59. The technological needs per se are not substantially different from other forest management activities. It is more a matter of degree, such as longer timber rotations (e.g., from 50-90 years to 100-200 years).

Pg. 4, P. 25:

As noted in the report (pg. 34), the Willamette River Greenway was selected by consensus of the Mitigation Team as the priority area for a [riparian habitat] mitigation exchange. An acre-for-acre exchange for prime habitat was recommended. Numerous potential properties were identified for purchase, if willing sellers could be found; only the top ten were prioritized (Appendix H). The tentative prioritization was based on those properties that would satisfy wildlife mitigation needs under this plan, and without conflict, provide some recreational opportunities that would meet planning objectives of the State Parks Department, under ODOT, who manage the Greenway lands. Final decisions on potential properties, based on ecological, social, management, availability, and many other considerations, will have to be made during the implementation phase. The benefit of converting private lands into public ownership or easements is, primarily, long-term habitat protection. These areas, in close proximity to population centers, will receive increasing pressure from urban and agricultural development. Improvement activities on existing public lands are listed under "other" mitigation options (pg. 25; Appendix El.

Pg. 4, P. 26:

We are unclear as to the use of the term "intensive" silvaculture, apparently in conjunction with "steep slopes, northerly aspects, etc." These areas are not, generally, good candidates for intensive timber management because of existing thin soils, low fertility, susceptibility to erosion and reforestation difficulties. In general, good forest-producing lands are good wildlife-producing lands, and as noted in the report, some sacrifice in terms of timber products must be made in order to maximize wildlife benefits. Good timber management, particularly in today's terms, is not good wildlife management. On the other hand, as identified in management scenarios in the generic management plan (Table 7, pg. 55) the potential exists to cover O&M expenses over the long-term with revenues from timber harvest compatible with wildlife mitigation under this plan.

Pg. 4, P. 27:

There is no evidence that we are aware of, to support the concept that the aging process of North American forests can be accelerated. Our information, in fact, points to the contrary (Harris, 1984; Luman and Neitro, 1980; Gordon et. al. 1982). We do accept the concept that some habitat manipulation can be applied to second-growth forests to enhance wildlife habitat, such as snag creation, fertilization, forage-species plantings and thinnings to increase canopy layering or to create small openings.

Pg. 4, P. 28:

The Preferred Mitigation Alternative (Section IV.A) has been revised to provide as much flexibility as possible to meet the range of concerns pertaining to mitigation for the old-growth habitat component. Option two of the Preferred Alternative (pg. 41) proposes the purchase of second-growth forest as indirect replacement of old-growth habitat. We feel that all three options are viable (pg. 41-42) and the next phase of the program will determine what is practical and possible.

Pg. 4, P. 29:

In the area of the Humid Temperate Climatic Zone in which the Willamette River Basin is located, the Douglas fir-western hemlock forest represents a long-lived, stable subclimax community (Franklin et al. 1981). This forest association originally covered approximately 28 million acres of western Oregon and Washington (Harris, 1984). The large Douglas fir, with a life span of 350-700 years, can provide a significant component of these forests for up to 1,000 years before being replaced through natural succession. However, a long-term subclimax situation like this can continue, essentially, indefinitely if disturbed by natural phenomenon such as disease and fire.

Under this plan, the true old-growth condition will not be reached for at least 110-150 years, and there is the prospect of a long period of stability after that before the old-growth characteristics of the mature, dominant Douglas fir canopy are lost; therefore, we are not convinced that either extension of the old-growth period or revenue oriented management of the old-growth component, are issues of concern at this time.

Pg. 5, P. 31-32:

Outside of 1) loss of timber revenues to counties, which would be dealt with as an O&M cost 2) public access to possible Willamette River Greenway mitigation properties, and 3) possible increased elk-use of private timber lands if adjacent to key mitigation sites; we are unclear what significant impacts the USFS is referring to. The proposed key mitigation lands are relatively remote and all mitigation opportunities are determined by direction given in Section III.C (pg. 19-20). The overall intent was to avoid seeking mitigation opportunities where potential land-use conflicts existed (e.g., near agricultural areas, urban areas and locating mitigation sites where they would not be surrounded by private lands). We do not anticipate drastic land-use changes that would significantly disrupt surrounding land uses. Management plans for specific sites will be developed based on the most recent information available for the Cascade Range.

Pg. 5, P. 33:

These considerations, implicit on national forest lands under the multiple-use mandate from Congress, 'are not implicit on lands proposed to meet the needs for wildlife mitigation. Under the CRB Fish and Wildlife Program, this mitigation plan is responsive to a separate mandate from Congress. In fact, certain activities, depending on degree, could seriously undermine the mitigative intent of this plan (e.g., excessive roading, bridge-building, types of recreation and incidental uses).

Pg. 5, P. 34:

As noted on pg. 59, management plans for specific sites would have to be "tailor-made."

Pg. 5, P. 35:

Ownership and management of the mitigation lands will need to be worked out during the next program phase. Information provided by the USFS at this time indicates the management mandate to which they are responsible (i.e., multiple-use) may not be compatible with wildlife mitigation needs under the CRB Fish and Wildlife Program, as they apply to the Willamette Basin. Integrated management is an obvious necessity; how it is to be achieved needs yet to be determined. Considerably more analysis and discussion is needed on this topic.

Pg. 5, P. 36:

This is discussed in the report on pages 45-46; and 51-59.

Pg. 5, P. 37:

As noted by USACE (Comment Letter, J2-5), these acreages were not identified during the planning process. None of the Mitigation Team participants, including the USACE and USFS representatives, felt significant opportunities existed on USACE lands surrounding the reservoirs, and recognized what did exist was in narrow strips or isolated patches of habitat. We are unclear whether the habitat USACE is currently promoting includes lands under USACE-USFS Memorandum of Agreement, in which case they would be managed by the USFS. We are under the impression that 'the only lands USACE retains under their direct management at the Willamette Basin projects consists of those lands below the high-water line, and lands in immediate proximity to the dams, where buildings exist, or land-use may affect operation of the projects. We are willing to review this potential mitigation opportunity again, if the USFS and USACE will provide us with the necessary information; and if the Mitigation Team, on re-evaluation, feels it provides significant, potential mitigative opportunities.

Pg. 5, P. 38:

We feel this concept is expressed incorrectly. Public support is important to the ultimate success of mitigation planning in the Willamette Basin, as it is elsewhere in the Columbia River Basin. She overall mitigation effort in both fish and wildlife is to compensate to the people of Idaho, Washington, Montana and Oregon for the loss of their resources. The fact that the CRB Fish and Wildlife Program is the product of a Congressional Act, already indicates it is the will of the people to mitigate for fish and wildlife resources impacted by hydropower development in the past, present and future. The general public, through the democratic process (including extensive opportunities for public hearings and comment) have already indicated they feel it is in their best interests to provide mitigation for these losses. As determined by the Regional Power Act and the CRB Fish and Wildlife Program, it is up to the state and federal agencies and tribes in consultation with interested parties, to define, using the best scientific information available, what form that mitigation should take. The "degree" and overall direction for the mitigation comes from the NPPC and its interpretation of public comment. The groups identified by the USFS will have ample opportunity to work with the planning process.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208-2870

REPLY TO ATTENTION OF:

March 30, 1987

Environmental Resources Branch

Ms. Janet McLennan
Assistant Power Manager for Natural
Resources and Public Services
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Ms. McLennan:

In response to the 13 February 1987 letter from Mr. Jim Meyer of your staff, we have canpleted our review of the draft report entitled "Wildlife Habitat Mitigation Plan at Federal Hydroelectric Facilities: Willamette River Basin, Oregon." Our specific comments on the cited plan are enclosed.

The Corps of Engineers, Worth Pacific Division, remains in-opposition to wildlife mitigation for the construction and operations of the Willamette Valley hydroelectric projects identified in the mitigation plan. At the time these projects were constructed the mitigation recommendations made by the fish and wildlife agencies under the Fish and Wildlife Coordination Act were singularly focused on facilities and regulated river flows for fish. The requested fish facilities and flow schedules were provided and are operated andmaintained as agreed upon by the Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and the Corps of Engineers. Little or no interest in themnagemntofwildlifeandassociatedhabitatwasexpressed by the fish and wildlife agencies until enactment of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 and subsequent adoption of the Columbia River Basin Fish and Wildlife Program in 1982.

The Corps of Engineers is sympathetic to the ecological importance of old growth forest, riparian vegetation, and winter range for big game as identified by the fish and wildlife agencies. However, we believe that pursuing the management of such plant communities under a mitigation concept is neither cost effective nor justified. None of thewildlife reports prepared to date for the Willamette Valley hydroelectric projects have identified or substantiated a loss or a threatened loss of a specific animal population as a result of the construction and operation of those projects. Instead, the approach taken by the fish and wildlife agencies is to simply replace the plant communities lost through project construction with acreage at another location which is already under the management of some other entity. The strategy is to then increase the carrying capacity of the acquired resource through intensive management. However, based upon existing evidencethe affected wildlife populationscurrentlyappeartobein-balance with the available habitat and present land uses.

Associated with our concern for land acquisition, as discussed above, is our belief that the modified Habitat Evaluation Procedure used on these projects does not meet the criteria and assumptions established for the procedure. Both of these concerns have been expressed repeatedly over the past couple of years during our participation in the various consultation and review meetings.

The Corps of Engineers remains firm in its belief that the wildlife resource would be best served in the most cost effective manner if the fish and wildlife agencies would establish the goals and objectives for the target species to be protected in the Willamette Valley. To do so would provide the Corps of Engineers and any other land management agency with the necessary direction and opportunity to prepare management plans and budgets to achieve measures mutually agreed upon by all concerned parties.

The North Pacific Division and the Portland District remain open to discussions on the protection of selected wildlife species, the formulation of management objectives, and the preparation of management plans under the Columbia River Basin Fish and Wildlife Program. In that regard, we recommend that the entities involved consider 'the preparation of management plans for the species identified in the "mitigation plan" that are to be featured within the Willamatte Valley.

Please notify this office if you have any questions regarding our position on this matter or the enclosed comments.

Sincerely,

James R. Fry
Colonel, Corps of Engineers
Deputy Division Engineer

Enclosure

CF (w/encl) :
Meyer, BPA
Peloquin, NPDCO-R
NPPDE
NPPPL
NPPOP

CORPS OF ENGINEERS REVIEW COMMENTS ON THE DRAFT WILDLIFE HABITAT MITIGATION PLAN FOR FEDERAL HYDROELECTRIC FACILITIES, WILLAMETTE RIVER BASIN, OREGON

Prepared by
Oregon Department of Fish and Wildlife
for
Bonneville Power Administration

Item 1. Page 4, II.A.4, Paragraph 2, Sentence 2.

"...quality of habitat lost no longer exists in proximity to the project area..."

This statement is an oversimplification of the issue. Habitat of suitable quality does exist in the vicinity of the projects, but often in smaller tracts than desired for effective management and/or is under the control of the USFS/BLM whose management objectives for particular tracts may not be amenable to management as mitigation sites. However, the same tracts of land could be managed with USFS/BLM cooperation as management units under protection as a good stewardship measure.

Item 2. Page 5, II.B.1, Paragraph 4, Sentence 1.

"Extreme water level fluctuations at most of the Willamette projects have precluded revegetation of the reservoir shorelines."

These water level fluctuations prevent establishment of riparian zones or development of wetland plants within the reservoir confines; specifically the upperpool elevations. The shorelines are vegetated with upland plant communities. It is the drawdown zone that lacks the "... escape cover and/or nesting, feeding, and resting habitat..." referred to in sentence 2 of this paragraph.

Item 3. Page 6, II.B.3, 1st Sentence and last Sent-

Bald eagles are noted as having gained 5693 hu's in the first sentence whereas the last sentence in this paragraph states: "The value of the reservoirs to bald eagles has not been measured and could be seasonally limited by lack of perching sites, human disturbance and distance to suitable nesting sites." We contend that the interagency team's determination that bald eagles gained 5693 hu's constitutes assignment of a value to these reservoirs for bald eagles. Thus the last sentence should be stricken.' Additionally, Green Peter, Lookout Point, and Hills Creek reservoirs support both nesting (4 nests total) and wintering populations of bald eagles. The other projects support wintering birds. It is unlikely that perching sites are limiting for bald eagles as they exhibit great flexibility in the type of structure used. Human disturbance and nesting habitat are factors influenced by both on-project and off-project events.

Item 4. Page 6, II.B.3, Paragraph 4, last Sentence.

Last sentence refers to increases in nesting ospreys at several reservoirs. Recent information indicates that nesting population of osprey at Lookout Point/Dexter Projects has decreased with the occurrence of nesting bald eagles at Lockout Point (reference Charlie Bruce, Larry Gangle). Additionally, ospreys have probably increased in the vicinity of Green Peter/Foster Projects (reference Charlie Bruce, Wayne Logan). Thisinformationshould be updated and is believed available in the notes from the last few "loss assessment" meetings held by the interagency team.

Item 5. Page 6, II.B.3, Paragraph 5, Sentence 1.

". ..no wildlife measures were taken at any of the eight projects to offset the impacts to wildlife resulting from construction and operations of the dams."

This statement is misleading. The sentence should state'that no formal wildlife mitigation measures were requested or required by the resource agencies and therefore none were implemented as mitigation measures by the Corps of Engineers. Likewise, in the absence of any management objectives or plans, the Corps has no direction or guidance to follow in developing a wildlife program complimentary to the fish and wildlife agencies.

Item 6. Page 6, II.B.3, Paragraph 5, Sentence 2.

Refer to comment 2 above.

I tern 7. Page 7, II.B.3, Cont. of Paragraph 5, last Sentence.

". ..distance to cover increases vulnerability to predation for many species."

It would be more appropriate to state that the drawdown zones lack food and cover to attract wildlife, hence the very limited use of those areas.

Item 8. Page 7, II.B.3, Paragraph 6, Sentence 5.

"The USE'S and ODEW are experimenting with sedge plantings..."

It should be mentioned that sedges have been successfully establishedand receive considerable use by elk in winter (i.e. Green Peter). Work was accomplished under special arrangements with the Corps, including the use of contracts.

Item 9. Page 7, II.B.3, Paragraph 9, last Sentence.

Substitute "drawdown zones" for "shorelines."

tem 10. Pages 10-13, II.B.1.1, Big Game.

The discussions on Roosevelt elk and black-tailed deer detail management (i.e. population) objectives for each species set by ODFW, USFS, and BLM. How do these objectives relate to one another? Aretheybaseduponone overall population goal or are they independent and restricted only to each agencies administrative unit? Conceivably they were derived through summation of planning unit goals (i.e. watershed, drainage system). What are the goals for the drainages in which the Corps projects occur and what are the present estimates of elk and deer populations in each? The discussion notes that the benchmark population goals have not been officially adopted and serve as a planning aid at present. Are such goals going to be officially established in the near future and will they be at the present levels? Which agency goals have precedent and are they mutually supportive? For black-tailed deer ODFW estimates (page 12) indicate that the deer population in the southern Santiam unit has met or exceeded the benchmark objective. Additionally, the USFS notes (page 12) that the deer population in the Willamette National Forest presently exceeds the optimum level. Is mitigation for COE projects necessary where population goals have been met or exceeded? There seems to be no regionally coordinated goal for these species or most other target species upon which all agencies can agree to or strive for fulfillment. We suggest management issues such as this be resolved in the Columbia River Basin Fish and Wildlife Program so as to permit all land management agencies the opportunity to support the program through their own initiatives.

tem 11. Page 16, bald eagle.

There are at least 9 existing territories in the Willamette Basin and substantially more in the Umpqua Basin which indicates that this information (i.e. ". ..5 existing territories...") is somewhat outdated. A compilation of bald eagle nest locations etc. by Frank Isaacs and Robert Anthony, Oregon State University is available which contains recent information.

tem 12. Page 17, III.C. Paragraph 1, Sentence 4.

"Negligible "on-site" (i.e. on USACE lands) opportunities existed..."

Although the COE representative attending the Willamette Basin mitigation meetings agreed in principle with the above referenced comment, we now wish to propose a more extensive use of COE project lands. Coniferous forest of variable age exists on COE project lands. The concept of "functional old growth" discussed on Page 32 of the document could be applied to Corps holdings around these projects. Acreage information (Table 1), derived from the vegetation inventory for the Wildlife & Wildlife Habitat Loss Assessments for the Willamette Basin Projects, indicates the 5396 acres of forested habitat is potentially available for inclusion as functional old growth habitat on these projects. An additional 1003 acres of old growth habitat presently exists on these projects (Table 1). We also recommend that similar lands around other COE projects in the Willamette Basin (i.e. Cottage Grove, Dorena, Fall Creek, and Fern Ridge) could be dedicated to the same purpose. The short timeframe allowed for this review precludes determination of the acreage involved but a substantial amount is probably available. Some of these lands are presently managed for recreational purposes; management as an old growth forest may not be incompatible with that objective (i.e. Whitcomb Peninsula, Green Peter Reservoir.)

These cover types are typically narrow strips of habitat surrounding the projects although fairly large units do occur. We recognize that they do not provide all the attributes that large, contiguous blocks of old growth forest provide. However, these islands or stringers of habitat have the potential to meet the habitat requirements of many species, including at least three assessed in this mitigation plan. Pileated woodpeckers, bald eagles, and osprey could benefit substantially from such a designation. Spotted awls might also benefit from such a designation provided an adequate prey base is present and there is adjacent suitable habitat for the species. Designation of these lands for old-growth management would be compatible with most Corps resource use allocations for these lands. They would not detract from the allowable timber cut base and their preservation would be consistent with maintaining the scenic quality of the reservoir setting.

Further analysis is required to determine the management value of these lands under such a dedication as their configuration and location would preclude extensive use of these lands as critical winter range for big game. They do provide an econanical alternative for old growth coniferous forest mitigation. As identified later in this report, such habitat is limited in availability and costly to acquire.

Item 13. Page 18, III.C, Paragraph 8.

Mitigation plan has the option of removing "timber management constraints" from wildlife management.

The gist of this paragraph is somewhat misleading, implying that the mitigation plan will remove wildlife management-as a poor sister to timber management on BLM and USFS lands. The plan, based upon our review, would principally acquire private lands for wildlife management and would not occur on BLM or USFS lands, therefore management there is not affected.

Item 14. Page 22, III.E.4, Paragraph 3.

Planting of sedge plugs and willows appears to be a more promising alternative to seeding of grasses for the production of green forage for elk. , It also does not require the high annual maintenance costs of seeding.

Item 15. Page 25.

Certain management opportunities identified in the report (i.e. Candiani Island, Five Islands) are property of the State of Oregon and have high riparian values at present. It is difficult to believe that these sites could be improved upon given their present condition. We recommend that sites presently owned by State or Federal government and containing excellent riparian habitat be dropped from consideration as mitigation sites and given more attention under a protection clause using a good stewardship concept.

Item 16. Page 35, IV.A.3.4, "Tangible Losses," Paragraph 2.

"Although... difficult to quantify...unmitigatable (check your spelling here) losses under this plan..., it is felt these losses essentially cancel out the gains for bald eagles, osprey, and waterfowl."

Based upon this statement, has not the unmitigatable old growth habitat discussed in Paragraph 1, subsection 2, on page 35, been traded off and mitigation for it cancelled because of the gains by bald eagles, osprey, and waterfowl. If so, then why does the plan continue to seek "functional old growth" and not continue to allow consideration for volunteer programs under a goodstewardshipconcept? .

Item 17. Page 36, IV.A.5, Paragraph C.

Would it be legal or responsible to use funds generated from Willamette Basin Mitigation elsewhere in the state? Funds would be federally derived.

Item 18. Paae 48, Plan C, Sentence 3.

Would not the 500 acres be managed on a 100 year rotation rather than a 200 year rotation as stated?

Item 19. Paae 53, IV.B, Other Mitigation Alternatives Considered.

This section discusses alternative mitigation strategies and why they were not selected. Protection under a good stewardship concept does not appear to even be discussed. Based upon this analysis, availability of suitable mitigation sites, general cost, and/or biological values were factors for which these alternatives were dropped from consideration. We believe it is still premature to drop these options from consideration prior to the determination of the loss attributable to hydropower and/or application under a protection/good stewardship concept.

Item 20. Page 66, Appendix V, Preferred Alternative.

". . .wildlife losses attributed to hydropower responsibility should be equal to the proportion of reservoir releases that provided power benefits."

COE reregulatory dams (i.e. Big Cliff, Foster, and Dexter) play an important role in fisheriesand wildlife habitat conservation. These structures allow for releases of stored water in a controlled manner that precludes severe fluctuations in stream water levels. Such control minimized adverse impacts associated with power production for peak energy requirement periods on aquatic and riparian habitats downstream of these projects. Thus releases from the rereg facilities provide a benefit to wildlife that has not beenanalyzed. Does the benefit derived from reregulation offset, exceed, or meet the losses incurred fran construction of these projects on wildlife? We believe that this should be taken into consideration in the assessment.

Item 21. Appendix B: An Analysis of the Responsibility of Hydropower to Mitigate Losses.

a. General. We recognize the difficulty of fairly allocating losses between the many different purposes served by the Willamette River projects. However, we strongly disagree with the "preferred alternative" for distributing the costs of mitigating for wildlife losses as presented in this report. The "preferred" approach, as presented, simply identifies the percentage of water that passes through the turbines and assigns this same percentage to hydropower as its share of related wildlife losses. This approach totally ignores the multipurpose use of the stored water. See comments c. and d. below for a detailed discussion of the authorized operation of the projects.

b. Corps Recommendation. As the Corps has stated before, we feel the only reasonable way to account for relative losses to wildlife from the different project purposes is to use the joint-use percentages defined by the Corps and other water resource agencies' prescribed method of Separable Cost - Remaining Benefits allocation procedure. Since the Willamette projects were scoped and are operated using this benefit oriented procedure, it represents the fairest andmostquitableapproachtoallocating costs.

c. System Operation. By authorization, the projects are operated to meet downstream needs and power is generated from these other purpose releases (i.e. flood control, water storage, conservation flow). Very seldan in the history of the projects has there been a significant operation based on power needs alone. Specific power demands have occurred during the refill period February 1 to early May or during the winter months when the exclusive power storage has beenused. Power generation during the refill period has been requested by EPA in a few years and has normally been complied with if a significant snowpack exists that would insure refill of the projects. This year, for example, BPA requested additional power generation, but was turned down due to the below normal snowpack. Power generation from the exclusive power storage pool has only been used an estimated 3 to 4 times since the projects were built and then only a small portion of the power storage was utilized to assist BPA in a short term, high power demandperiod.

d. System Authorization. The Preferred Alternative is misleading as it talks about development of hydropower projects instead of multiple-purpose projects. Also, the last sentence in the 2nd paragraph (i.e. Within the limits of flood control, reservoir releases and storage during the six winter months are determined by the power requirements-(House Document No. 531") is taken out of context when isolated from the rest of the paragraph in HD 531, which is as follows:

> Page 2238 Paragraph 11, Factors limiting releases for power- The limits of storage release of water for power and all other uses are established primarily by flood control requirements. In addition to the limitations imposed by flood control, water releases to meet the requirements for fish life, irrigation, navigation, domestic water supply, recreation, and pollution abatement during the summer months may further reduce the volume of stored water which would otherwise be available for power production during the fall and winter months. During the 6-month period, releases and storage (within the confining limits of flood control) are determined by the power requirements. Fish requirements are always less than power requirements during this Period. During the spring and summer months no releases would be determined directly by power requirements though during the latter months of the period releases for any purpose other than for fish life, irrigation, or domestic use might be slightly reduced to assure enough storage to start the winter period at the required minimum reservoir elevation.

Because of the above information and storage allocated for power as described in HD 531 as follows:

> Page 2057, Paragraph 77, — It is planned to operate these plants as part of the Columbia River power system rather than as individual units. Therefore, storage regulation for power would be a prime consideration during the critical power production period for the system, which occurs when the flows in the Columbia River are low, in the months of October thru March, During the remainder of the year, power production would be incidental to reservoir releases made in the interest of other conservation uses.

And also described in:

> Paragraph 78 — Conservation storage for power production would be made available by use of some primary flood control storage, all secondary flood control storage, and all storage space assigned exclusively to power. Water stored in primary flood control storage space would be used for power purposes in the 1 1/2 month period between October 1 and November 15, the latter date being the latest that water to supply conservation requirements could be held in primary flood control storage space.

Item 22. Page 73, Appendix D, Background.

This section details the recent development of wildlife and wildlife habitat policies, goals, and standards by ODFW. These institutional objectives, at the time when Willamette Basin Projects were constructed, were considerably different, and, in conjunction with regional politics, undoubtedly played a major rule in the decision not to seek wildlife mitigation for these projects. The Regional Power Act does not assign responsibility, but instead seeks redress of losses attributable to hydroelectric developments and the development of an organized program containing goals, objectives, and plans. As pointed out in this report, substantial costs are involved in attempting to redress wildlife and wildlife habitat losses on the Willamette Projects of the Corps. In our opinion, much of what is claimed as a loss is poorly justified. The Corps mitigated for fisheries losses as requested by the resource agencies, and if requested and justified, would have provided for wildlife mitigation. The situation then and now appears to be similar. A practical wildlife management program under a good stewardship concept following mutually agreed upon plans would solve most of the problems discussed in the mitigation report.

Item 23. Appendix D. Although various authors are cited, no literature citations are provided. Suggest they be listed.

Table 1. Acreages of cover types by project where old growth management represents an option.

Vegetation Cover Type	Project								
	Green Peter	Foster	Hills Creek	Dexter	Lookout Point	Cougar	Detroit	Big Cliff	Total
Temperate Conifer Forest, Open Pole	149		180	17	299	314		5	964
Temperate Conifer Forest, Closed Pole	88		63	8	419	326	43	2	432
Temperate Conifer Forest, Open Sawtimber	106	i5					179	2	302
Temperate Conifer Forest, Closed Sawtimber	408	1					1,082	27	1518
Temperate Conifer Forest, Old Growth	6		442		239	289	27		1003
Conifer-Hardwood Forest, Open					2		51		53
Conifer-Hardwood Forest, Closed	717	288	84	256	639	20	106	17	2127

Response to Specific Comments: USACE

General Response to pages J2-1 and 2:

As USACE notes in their letter (Item 22), Regional politics precluded the achievement of wildlife mitigation in the Willamette Basin at the time the projects were built. Because USACE repeatedly indicates (Items 5 and 22) they "would have provided for wildlife mitigation" if the wildlife agencies had provided the direction, we fail to understand their present position of "remaining in opposition" to wildlife mitigation. The need for wildlife mitigation is even greater now than it was 40 years ago. Habitat depletion is occurring at a dangerous rate. The wildlife agencies are now providing relatively precise direction, and mitigation is being pursued under a congressional mandate that reflects the will of the people in the Pacific Northwest. What is important to recognize now is not who or what was responsible for the oversight, but that an oversight occurred, and it is now time to "get on with the job."

As explained in this paper, this is a habitat-based mitigation plan, not population-based. It would be, biologically, very naive to think that 20,123 acres of prime habitat contained no animals. However, particularly for historic assessments, habitat is a much better focus to determine losses because of the existence of air photos, vegetation descriptions, knowledge of vegetation zones and the present vegetation of adjacent 1 ands. Considering the lack of accurate population data available for wildlife during the period prior to project construction; and the superior, recent habitat assessment techniques and knowledge, not using a habitat-based approach would have been inconsistent with the need to provide information based on "the best available scientific knowledge" (Regional Power Act, Section 4(h)(1)A-6).

We are unclear as to the point of the last paragraph on page J2-1. This does not describe the direction of this mitigation plan.. We are not aware of the evidence referredto that indicates the affected wildlife populations are in balance with the available.habitat and present land uses.

Item 1 (Page J2-3):

We do not feel this statement is, in any way, an oversimplification of the issue. There is no argument that the low-lying lands consisting of mature old-growth forest and other intact habitat, was of higher quality than that existing in proximity to the reservoirs today, which is comprised largely of a mixture of clearcuts and various stages of second-growth timber on steeper slopes and at higher elevations. The USACE comment is vague in its reference to "habitat of suitable quality." What is suitable quality? 'For what is it suitable? Where exactly is the habitat? How could the mutual management be accomplished? As USACE admits in Item 12, over the past year, during which time we were wrestling with questions of this type, the Mitigation Team did not feel that habitat existed in proximity to the reservoirs to mitigate for the quality of the big game winter range, riparian habitat or old-growth forest lost. Small patches of isolated habitat have greatly reduced habitat value for most wildlife species. Whether or not, in the final analysis, the involved parties accept this lower quality habitat as partial mitigation, is an entirely different issue.

Item 2:

To our knowledge, the term "shoreline" has not been effectively defined in absolute terms. It is generally understood that permanent upland vegetation is not found on shorelines because of periodic inundation. Although some permanent vegetation is found on shorelines (e.g., kelp, certain sedges, etc.) it is always water-adapted. The definition of "upland" on page 3 of Cowardin (1979), is "land with predominantly mesophytic or xerophytic cover [vegetation]," (i.e., adapted to drier conditions). The drawdown zones are specific to reservoirs which are an artificial lacustrine system, and these zones do not support upland vegetation. Therefore, in our view, they are equivalent to shorelines. Research discussed on pages 7-8, is currently being conducted on drawdown zones to determine which water-adapted plants can survive in these areas.

Item 3:

We agree with USACE that the Mitigation Teams' determination of HU's for bald eagles constitutes assignment of a value. As noted, this value is based largely on increased foraging opportunities offered by the reservoirs. However, this value is a habitat availability and historical assessment, not a systematic study of bald eagle reservoir-use. With dramatic, periodic water fluctuations, reservoirs are not a constant ecological system. This factor and the other factors mentioned (pg. 6), might be found to influence bald eagle .use of the reservoirs if systematically studied. Because this possibility exists, we feel it should be mentioned.

Item 4:

Bald eagle-osprey interactions have been updated. We have been unable to document osprey increases at Green Peter and Foster projects.

Item 5 (pg. J2-4):

It is not difficult to understand how wildlife concerns were neglected 25-40 years ago when the same neglect persists today. The wildlife agencies have been consistently discouraged from pursuing mitigation for wildlife from a wide range of developmental impacts. In 1948 the USFWS recommended mitigation measures for the proposed Willamette Valley projects as a whole, including: a study of the effects of the project on upland game and furbearers, with a view to recommending feasible management practices beneficial to these animals; consideration of establishing a federal wildlife refuge at Fern Ridge; and land acquisition and development for waterfowl. At the same time, the Oregon State Game Commission proposed specific mitigation measures for the Willamette Valley project, including increased law enforcement, feeding sites, marsh development, and furbearer research and management (Bedrossian et al. 1984).

These recommendations stagnated, not because the need did not exist, but rather because the mitigation opportunities did not appear to be available for wildlife. This attitude toward wildlife mitigation exists today relative to the CRB Fish and Wildlife Program, even though Senator John Dingle, major proponent of the Regional Power Act, stated that "from the beginning of our consideration of the bill in the House, we have stressed the need to protect, mitigate and enhance both fish and wildlife." The fact remains, no wildlife mitigation occurred in the Willamette Basin to offset the very real impacts to wildlife habitat that occurred, and we do not feel the statement on page 7 of this report, is misleading. The allusion in Item 5 is, clearly, that wildlife mitigation did not occur because of lack of direction from the wildlife agencies. We assume that, as directed by the Regional Power Act, now that wildlife losses have been clearly identified and definitive mitigation measures recommended, USACE will support correction of this historical oversight.

Item 7:

Both concepts are correct (refer to paragraph 2, pg. 7); the important point being, the lack of vegetative growth in the drawdown zones.

Item 8:

An expanded discussion of this topic is on pages 7 and 8 of this report.

Item 10 (pg. J2-5):

Discussions of Roosevelt elk and black-tailed deer are both included under Big Game (page 11-14) because both were used as loss assessment and mitigation planning evaluation species. As noted in the report, however, separate mitigation for 17,254 HU's lost by deer was not sought (page 13). As discussed on page 11-13, population goals for elk have not been met according to ODFW, BLM or USFS. An amalgamation of population goals is a result of dialogue among the various agencies and must take into consideration many different factors. ODFW is currently working on statewide management plans for important wildlife species in Oregon. During the next phase, this mitigation plan must be coordinated relative to specific mitigation. sites and overall population goals. Identification of the original representative mitigation sites, specifically addressed the needs of Roosevelt elk in terms of current management.

Item 11:

Information updated, page 17.

Item 12:

See comment on USFS letter, pg. 5, P. 37 (J1-12).

As noted on J1-12, we are willing to evaluate these areas again if USACE and USFS will provide us with the pertinent information. It must be recognized, however, that isolated habitat segments are of low value

and, in order to provide mitigation, require considerably more land area than of the prime habitat that was lost (see Section III.D, top of page 22). The pileated woodpecker is the only evaluation species USACE indicates would benefit that sustained habitat loss. The desireable habitat area per spotted owl pair is 2,200 acres (pg. 16). We are skeptical such areas can be found near the reservoirs, and all of these areas would be second-growth forest. The term functional old-growth is specific to this report (pg. 74) and is not necessarily applicable off the key mitigation sites (pg. 19, Section III.D). We do not feel its application is pertinent to areas around the projects.' If mitigation opportunities are identified, we anticipate they will fall under Option 2 of the preferred mitigation alternative, which would be partial indirect mitigation of the outstanding old-growth forest debt, with second growth forest (see Table 2, pg. 26).

It is unfortunate the USACE waited until after the draft report was completed to propose this approach. Adequate attention cannot be given to the proposal at this time.

Item 13 (pg. J2-6):

The intent of this statement (pg. 19, No. 8) was to indicate an ability under this plan to optimize wildlife at the expense of timber revenues. (See discussion, pg. 64-65).

Item 14:

See discussion, pg. 7-8 of this report.

Item 15:

See Appendix H for ownership status of potential mitigation properties identified along the Willamette R. Greenway (e.g. Five Islands = privately owned). These sites are recommended as prime habitat on an acre-for-acre mitigation credit exchange.

Item 16:

Because direct replacement of old-growth values is not very likely, the unmitigable portion of the old-growth component referred to in no. 2, pg. 35 is the value of the habitat lost because of time lag (for growth), higher elevation, isolation, etc. These are losses for which mitigation is not being fully sought. The outstanding old-growth acreage debt of 3,900 (prime) acres, based on the Structural Replacement Goal (pg. 20-23) is not related to the functional old-growth credit given on the key mitigation sites (1,228 acres). The functional old-growth on the key mitigation sites is being credited to gain long-term habitat protection. There is not yet resolution as to how to mitigate for the outstanding 3,900 acres (pg. 40-42).

Essentially the bald eagle, osprey and waterfowl gains are being traded for all of the extensive but unquantifiable losses which cannot be mitigated now. We do not see the connection between unmitigable losses and a good stewardship concept.

Note: According to Webster's Unabridged Dictionary (Gove, 1968), the following are acceptable forms of the word mitigation: (un)mitigable, mitigate, mitigatedly and mitigative.

Item 17 (pg. J2-7):

These funds, in the long-term, would not be federally-derived if the land, as it should be, is under state management. The CRB Federal Power System has a debt to the citizens of Oregon. We are recommending that debt be paid, principally, through land acquisition. Once the debt is negated, and all O&M and other associated costs with mitigation under this program are met, revenues should be used by the state in the best interests of wildlife.

Item 18:

Correction made, pg. 58.

Item 19:

On December 23, 1986, a memo was sent to all Mitigation Team members for review and comment. This memo contained, in addition to an overall concept of the mitigation plan, the "other" alternatives identified in the February 10 Draft Report. At that time we did not receive word from USACE that they wanted to consider Good Stewardship as an alternative, or what exactly this would be. Because, according to the response of USACE to an ODFW informational request (9 May 1986), no good stewardship program exists in the Willamette Basin, and we are unclear as to its mechanisms, objectives, etc., we have not included it as an alternative to the present mitigation plan.

Item 20:

The re-regulatory dams in the Willamette system may mitigate for some impacts to fisheries. That assessment is beyond the scope of this paper. The rereg dams have no significant effect on the reservoir fluctuations and the extent of the original impacts to wildlife habitat caused by the projects. The rereg dams could possibly offset secondary impacts such as downstream water fluctuations, as pointed out by USACE. However, as noted on page 3 of this report, these secondary impacts were not addressed in this mitigation plan, and because neither the impacts nor benefits to wildlife were analyzed, they are not relevant to the present study. There is no question that, except in relation to secondary impacts, the rereg facilities do not provide mitigation for the impacts identified in this report; they are a partial cause of the impacts.

Item 21 (re. Appendix B):

The contention of the Preferred Alternative for allocating mitigation responsibility in Appendix B, is simply, that wildlife mitigation and power be treated equally. Water allocation for "fish life" does nothing to mitigate for thedlife losses described in this study. There is relatively little that can be done, in the operation of these facilities

now, to mitigate for the wildlife losses. The USACE excerpts provided, make our point abundantly clear: that the USACE proposal essentially "fixes" the wildlife mitigation proportion at a historic level, and continues to allow power to derive benefits from the system, above and beyond their, original fixed proportion. While the wildlife losses sustained by initial project developments have received no mitigation, and have been compounded by 25-40 years of inaction, power has gained, every year, its original proportion, and additional benefits dependent on the annual water conditions. Our alternative redefines the use-proportions in terms of actual use, rather than intended use; and makes the cumulative loss of wildlife habitat a major consideration relative to the ongoing benefits gained by power, which is frequently able to capitalize on water held for other uses (at the multiple-use projects). The two factors under discussion, resulting from project development (i.e., impacts to wildlife habitat and power benefits) have been moving in opposite directions since the construction of the Willamette Basin Projects: the wildlife losses have been compounding over the years, while the benefits to power have been gaining.

Item 22 (re. Appendix D):

It is important that USACE recognizes the role regional politics played in limiting the recommendation of wildlife mitigation in the Willamette Basin (see Item 5, above). We have included Appendix D'because this plan attempts to balance wildlife losses, potential mitigation and current management needs, to the extent possible.

As noted in the introduction, the development of a major plan to mitigate losses 25-40 years after initial impacts occurred, is not an easy task. As illustrated in Appendix A, full interagency participation was vigorously pursued. USACE has participated in the entire planning phase of this study, including the loss assessment phase. If the products do not reflect their concerns, they must accept part of the blame.

Item 23:

Unfortunately, Section VII (References Cited) was not complete at the time the draft report went out for review. References listed in Appendix D can be found in Section VII.

Portland Field Office
727 NE 24th Avenue
Portland, OR a 7 2 3 2

May 1, 1987

Mike Weland
Oregon Department of Fish and Wildlife
P. 0. Box 59
Portland, OR 97207

Dear Mike:

1 I have carefully reconsidered my March 26 letter (signed by Roger Vorderstrasse) to James Meyer, BPA. in which I described concerns of my agency regarding the mitigation proposals In the draft "Wildlife Habitat Mitigation Plan for Federal Hydroelectric Facilities, Willamette River Basin, Oregon." I have also re-analyzed the draft report, reviewed the rewritten sections provided by your agency, and discussed our concerns with you, your staff, and other members of the planning team.

2 As a result of the above, I feel that my initial letter accurately reflected the basic issues and concerns my agency identified during the planning process and in reviewing your proposals. I appreciate the discussions and rewritten sections your staff provided. They have helped to clarify some points, especially those relating to the "structural replacement" concept. However, several major concerns remain as described below.

3 1. Big Game Winter Range - Only about half of the big game winter range habitat losses would be compensated under the draft proposal. We believe the mitigation plan should pursue a goal of fully mitigating the loss of 15.295 Habitat Units of elk winter range. Acreage and cost estimates should be developed which would meet this goal.

4 2. Old Growth - The draft proposal would allow mitigation for old growth habitat losses at a level considerably less than the mitigation planning team's goal of 5,184 acres. While we agree that physical constraints prevent in-kind mitigation for old growth, we believe the report should support the planning team's goal and that alternatives for mitigating old growth losses (such as long-term management of forest lands which would eventually restore old-growth values) should be pursued.

5 3. Mitigation Cost6 - We are concerned that the draft report seems to over emphasize the cost of mitigating old growth habitat losses while under emphasizing the biological need for achieving the old growth mitigation goal. The assumed hfgh costs may discourage the serious consideration of viable alternatives. The costs identified with acquiring 40-year old timber have risen substantially since the first draft and should be verified. We also request

that all costs associated with purchase (i.e., $5,000-10,000/acre + appraisal fees and land costs) be explained, as well as how the total cost per acre may be as high as $15,000. In addition, we believe continued timber harvest (to the extent it benefits and is compatible with wildlife habitat needs) may be more than sufficient to offset operation and maintenance expenses and could reduce . the estimated mitigation costs.

6 4. Out-of-Kind Mitigation - The plan still allows the use of aitigation dollars to acquire and/or enhance "scarce valuable habitats," specifically wetlands. as an alternative to mitigating for old growth and or big-game winter range. We believe the mitigation plan should state that no out-of-kind ❑ itigation will be pursued until all reasonable opportunities to meet the mitigation goals have been exhausted.

7 In summary, we endorse the management concepts -the report identified to address the three major mitigation goals. However, we strongly believe they must be sufficient to meet the goal of offsetting Habitat Unit losses to big game (the highest priority mitigation goal), and to meet the acreage goal for old growth as well as riparian habitat. The conceptual alternative presented in our initial letter would go a long way toward achieving those goals. It involves purchasing more forested land in conjunction with the acquisition of general winter range. This would provide functional old-growth credits as agreed to by the team. It would also provide big game winter range value while reducing the need to acquire off-site riparian habitat.

8 My preference at this point would be for the planning team to reconvene and reach consensus on the mitigation goals and the basic elements of the mitigation plan. In view of the extent of the unmitigated wildlife losses that have occurred as the result of hydropower development in the Willamette Basin. it is important that agreement be reached soon so that the implementation of mitigation actions can begin as early as possible.

Thank you for your consideration of our views. Please contact me or Pat Wright at 231-6179 if you wish to discuss our comments in greater detail.

Sincerely,

Russell D. Peterson
Field Supervisor

Response to Specific Comments: USFWS

Pg. 1, P.2:

This paragraph misrepresents the participation of the USFWS in the planning process. Although the USFWS representative took part in the loss assessment and mitigation planning phases (Appendix A), the majority of the comments identified in their letter of 26 March 1987 (J3-5) were submitted after the deadline for comments on the draft report had passed, not during the planning process. This gave us inadequate time to respond to these comments as a Mitigation Team. As indicated, we did rewrite sections and discuss these with USFWS in an attempt to incorporate their late change of views.

Most critical to the missed opportunities for comment, was-a 29 January 1987 memo, which included our interpretation of the consensus of the Mitigation Team, and identified options for dealing with the old-growth forest loss. We specifically requested a written response to this memo (Appendix A). We received only a telephone call from USFWS stating their views were adequately expressed. No further indication was given to us that there was unresolved, unidentified disagreement. Although the draft report was sent to all Mitigation Team members on February 10, by the time of the formal coordination meeting on March 9, the USFWS representative stated he had not yet read the report. However, by delaying our plan, we have attempted to address the. USFWS concerns and feel their letter does not adequately acknowledge the efforts that have been made.

Pg. 1, P.3:

As explained in Section III.D (pg. 20), the Structural Replacement Concept, mitigation can be pursued either by seeking 15,295 HU's of critical winter range for elk per se, or by breaking down the habitat components into winter range, riparian habitat and old-growth forest. It is an "either-or" situation. We feel the-mitigation, as developed within this plan, provides compensation closest to what was truly lost. To seek mitigation for the 15,295 elk HU's and mitigation for 5,004 acres of riparian habitat and 5,184 acres of old-growth forest is, effectively, a proposal to mitigate for 150 percent of what was lost. Therefore, we'cannot support this recommendation.

Pg. 1, P.4:

This is exactly what options 1 and 2 of the Preferred Alternative propose (pg. 41). In both cases, the mitigation goal is to replace the amount of the old-growth debt not met by the 1,228 acres of functional old-growth on the key mitigation sites. In the case of 40-year second-growth, approximately 5,934 acres are necessary to replace the remaining old-growth debt of 3,956 acres.

Pg. 1, P.5:

We are unclear as to how we can further verify the costs of acquiring second-growth or old-growth forest within the scope of this plan (pg. 39-42; 43-45; Tables 2, 3 and 4). We have based our information on current prices according to USFS personnel. This is the best information we can obtain at this time. Large price fluctuations have occurred over the last ten years (Appendix I). We must wait and see what opportunities exist when it is time to begin implementation.

Cost information for old-growth and second-growth forest is discussed on pages 24-25 and Table 2 (pg. 27-32). The opportunity to provide O&M costs while maximizing wildlife management has been thoroughly addressed within this report [(e.g., pg. 45, 46, Table 3 ('pg. 47), Table 4 (pg. 50), Generic Management Plan (pg. 51-59)].

Pg. 2, P.6:

Option 3 (pg. 41-42) provides more flexibility than Options 1 and 2. We feel this is important to allow this plan to respond to future developments. We have stated clearly what the priority mitigation goals of this plan are, based on what was lost. In response to a 20 April 1987 meeting with USFWS, we changed the wording at the bottom of page 42 to satisfy their concern that insufficient emphasis was being given to direct and indirect replacement of old-growth forest. As discussed at that meeting, old-growth forest and wetlands are both "scarce valuable habitats." We are unclear as to why this change, made at their request, has 'not been acknowledged.

Pg. 2, P.7-8:

Outside of the fact that we cannot support a conceptual plan that seeks 150 percent mitigation, on the basis of the above comments, we feel, that to the extent possible, the USFWS concerns have been addressed. We look forward to working with the USFWS as well as the other Mitigation Team participants during the implementation phase to produce as effective mitigation as possible.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Portland Field Office
727 NE 24th Avenue
Portland, OR 97232

March 26, 1987

James R. **Meyer,** Wildlife Program Area Manager
Biological Program Evaluation Section
Bonneville Power Administration
P. 0. Box 3621
Portland, Oregon 97208-3621

Dear Mr. Meyer:

The Fish and Wildlife Service (FWS) has reviewed the drift "Wildlife Habitat Mitigation Plan for Federal Hydroelectric Facilities, Willamette River Basin, Oregon" and offers the following comments for use in preparing the final mitigation plan report.

GENERAL COMMENTS

1 The Fish and Wildlife Service has been an active member of the Willamette Basin wildlife mitigation planning team. From that perspective, we believe the draft report contains the basic information necessary to develop a detailed mitigation plan which adequately addresses the significant wildlife losses and mitigation goals identified by the planning **team.** However, the Fish and Wildlife Service strongly believes that the preferred **alternative** identified in the draft plan **must** be modified to insure that. old **growth** wildlife habitat and big game winter range losses are adequately mitigated.

2 As stated throughout the draft report, old growth was identified as one of three significant wildlife habitat types adversely impacted by the Willamette Basin hydroelectric facilities, and accordingly, the planning **team** identified the mitigation of old growth wildlife habitat, as one of its major goals.

3 Because the preferred alternative would **achieve less** than 30 percent of the old growth wildlife habitat acreage mitigation goal, it is unacceptable in its present form to the Fish and Wildlife Service. Further? the preferred alternative would only mitigate for approximately half of the big game winter range losses attributable to the development and operation of Federal hydroelectric facilities in the Willamette Basin.

4 We question the concept of possibly acquiring and/or managing off-site wetlands as a part of the preferred alternative with funds that could be utilized to attain more mitigation for those target wildlife species adversely impacted by the loss of old growth and/or big **game** winter range

habitats. Especially, when the adverse impacts to wetlands (other than riparian) attributed to hydroelectric development were relatively minor.

5 In view of the above, the Fish and Wildlife Service suggests the preferred alternative should be modified to more closely achieve the mitigation goals of the planning team, especially for old growth wildlife habitat and big game winter range. We believe this can be done utilizing many of the techniques described throughout the draft report. We have provided "specific recommendations under the heading "FWS Alternative" which follows.

FWS ALTERNATIVE

The preferred alternative is unacceptable to the Fish and Wildlife Service because of the following:

6 1. It would mitigate only half of the big game winter range losses attributable to hydroelectric development and operation, The planning team identified the mitigation of these losses as its highest priority.

7 2. Less than 30 percent of the team's old growth mitigation goal would be achieved. The mitigation of old growth wildlife habitat was one of the planning team's top three mitigation priorities.

8 3. It allows for the expenditure of funds to enhance off-site wildlife habitat types that were not significantly impacted by hydroelectric development in lieu of expenditures to meet the planning team's high priority mitigation goals.

9 In view of the above, and without going into great detail, we believe the preferred alternative should be modified to mitigate for 100 percent of the big game winter range losses and to fully achieve the team's acreage mitigation goal for old growth wildlife habitat. To achieve these goals, we believe the conceptual approach of the preferred alternative should include the following priorities.

10 1. Key Mitigation Sites - Purchase and manage 35,000 acres of private cutover timber lands which will mitigate 86 percent of the winter range losses, and satisfy 20 percent of the riparian mitigation goal as well as 40 percent of the old growth mitigation goal at a cost of $28 million.

11 2. Old Growth Habitat - Purchase 3,000 acres of private 40-year-old timber located within big game winter range and manage these lands to provide functional old growth wildlife habitat and its associated big game attributes. Based upon the cost estimates for 40-year-old timber identified in Table 2 of the draft plan, acquiring this land would cost $6 million. When combined with the 35,000 acres of "key" mitigation, this action would mitigate for 90 percent of the big game winter range losses and satisfy 70 percent of the mitigation goal for old growth. In addition, it would contribute 90 acres toward the riparian mitigation goal.

12 3. Riparian Habitat - Purchase 2,400 acres of Willamette River Greenway riparian habitat at a cost of $3.6 million. Together with the riparian mitigation from 1. and 2. above, this would satisfy 70 percent of the riparian mitigation goal.

13 4. Fully implement those management actions on hydro facility project lands that would provide cost effective wildlife mitigation. This requires no acquisition funds, and would further contribute to meeting all three mitigation goals.

14 Under the conceptual alternative described above, almost all of the big game winter range losses would be mitigated and over 70 percent of the mitigation goal for both old growth and riparian wildlife habitat would be achieved at a cost of 37.6 million. Compared to the preferred alternative, this proposal provides for nearly twice as much big game winter range mitigation and over twice as much old growth mitigation (Table 1).

SPECIFIC COMMENTS

The final report would be enhanced if it included a brief and concise Executive Summary.

15 FWS believes the final report should expand it.s discussion of functional old growth to explain that many wildlife biologists believe these areas (ie. 40yr. old timber stands) could be managed to enhance their value to wildlife, including big game (Frank Newton, ODFW, personal communication, 1987).

Section II.B.3, page 6, paragraph 3

16 The last sentence of this paragraph is misleading. It is our recollection that the value of the reservoirs to bald eagles was evaluated by the evaluation team,' and that the factors described were in fact considered as a part of that evaluation.

Section III.C and III. D, pages 19 and 20

17 We understand the rationale supporting the concept of structured habitat replacement. *However,* once it was realized that the habitat would *not* be replaced in the desired ratio of riparian, old growth, and general purpose winter range, we fail to understand why the winter range habitat unit mitigation goal became only 50 percent of what was lost.. From our discussions with other planning-team members, they also share our concerns. Accordingly, we believe the relationship between structural habitat goals and winter range mitigation goals needs to be discussed by the mitigation planning team. and if necessary, this section rewritten to reflect the concensus of the mitigation planning team.

Section III. E. 3 Old Growth Forest., page 21

Because of the limited number of sites and their costs as identified in b). the FWS believes that. a third option should be added to mitigate for old growth losses:

18 c) Purchase of younger (i.e., 40 year old) timber stands within known big game winter range to be actively managed for functional old growth and its associated wildlife attributes.

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Table 1. Comparison of Acquisition Costs and Mitigation Accomplishments of the Preferred Alternative (PA) and the Fish and Wildlife Service (FWS) Alternative.

Mitigation Opportunity	Acquisition costs $Million	Total Acres	General Winter Range Acres	General Winter Range Percent of H.U. Goal	Riparian Habitat Acres	Riparian Habitat Percent of Mitigation Goal	Old Growth Habitat Acres	Old Growth Habitat Percent of Mitigation Goal
FWS Alternative								
1. Key Mitigation Sites	28	35,000	35,000	87	1,025	20	2,145	4i
2. 40-year-old Timber Lands in Big Game Winter Range	6	3,000	3,000	3	90	2	1.500	29
3. Greenway Riparian Areas	3.6	2,400			2,400	48		
4. Mgmt. of Existing Will. Basin Hydro Proj. Lands	0	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Cumulative Totals	37.6	40,400	38,000	90	3,515	70	3,645	70
Preferred Alternative								
1. Key Mitigation Sites	16	20,000	20,000	50	585	12	1.,225	24
2. Old Growth Mitigation 1/	10	"500	Unknown	Unknown	Unknown	Unknown	"500	"10
3. Greenway Riparian Areas	6.6	4,400			4.400	88		
Cumulative Totals	32.6	"25,000	20,000+	50+	-5,000	100	"1,700	"34
Net Difference	FWS+5	FWS+15,000	FWS+18.000	FWS+40	PA+1,500	PA+30	FWS+1,900	FWS+36

1/ Based upon the information shown at the bottom of page 26 in the Draft Mitigation Plan Report, we assumed that the Preferred Alternative would result in the purchase of the Mary's River parcel, 250 acres at a cost of $1,000,000 and that the remaining $9,000,000 would be used to purchase an additional 225 acres of existing old growth habitat elsewhere in the Willamette Basin.

Section III. E. 4 Enhancement and Other Options

bj 1 and 2., page 22

19 FWS recommends that both of these options be included under Section III. E. 3 Old Growth Forest.

Section III. E. 5, Table 2

20 FWS suggests this table be modified to include the FWS alternative previously explained in this letter as a conceptual alternative to the preferred alternative . FWS would be eager to assist in this effort.

Footnote 8, page 29

21 FWS strongly disagrees with the language of this footnote. In essence it states that the effort that went into preparing the loss statements and the resultant mitigation goals can be abandoned and mitigation funds spent on resources totally unrelated to the development and operation of hydroelectric facilities in the Willamette Basin, especially if the costs are less. This concept is totally unacceptabble to the FWS and we believe it is in conflict with the mitigation concepts that fish and wildlife agencies have tried to instill into the development agencies over the last 10 years.

Section IV. A. 1, page 30

22 The FWS believes that under present environmental constraints it is possible to fully replace the big game winter range habitat units lost by increasing the acreage to be acquired as "key" mitigation.

Section IV. A. 2, page 31

23 We believe d. should be rewritten as follows: d. "Acquisition of land or management rights of existing old growth forest sites, and/or immature forest sites (i.e. 40-year-old) to be managed as functional old growth."

Section IV. A. 3. 1, Winter Range, page 31, paragraph 2

24 See our comments referring to Section III. C and III. D. pages 19 and 20.

Section IV, A. 3. 4, Tangible Losses, 2., page 35

25 The last sentence of this paragraph identifies two avenues for mitigation. The FWS does not believe the two options are of equal value. The first option would satisfy the mit igation goals of the evaluation team, while the second option would not. The paragraph should be expanded to reflect this difference.

Section IV. A. 3. 4. Tangible Losses, concluding paragraph page 35

26 Expanding this paragraph to explain that the gains to bald eagle. osprey, and waterfowl cannot be used to offset the losses to other target species, such as big game, would strengthen this section of the report.

Section IV. A. 6. b., last paragraph, page 38

27 The FWS suggests the following be added to this paragraph: "Another alternative to achieve the old growth mitigation goal would be to purchase stands of second growth timber and manage them as functional old growth. The cost would be substantially less - approximately $2,000 per acre for 40 year old stands, and depending upon the amount of key mitigation acquired for big game, the total cost could be as low as $6 million to fully achieve the mitigation acreage goal."

Section IV. A. 6. 1

Alternative 1, pages 39 and 40

(These comments are offered in addition to our previous comments on the preferred alternative or Alternative 1).

28 Alternative 1 would be significantly improved if it placed a higher priority on meeting all three of the major mitigation goals established by the mitigation planning team.

29 We believe the $10 million proposed for mitigation "above and beyond" the total costs of winter range and riparian mitigation should be dedicated to meeting the, third mitigation goal - old growth, and utilizing these funds to achieve the old growth goal should not he dependent upon cost-sharing or similar artificial restrictions.

30 Further, the FWS believes that Alternative 1 should be written to insure that the rate payer's dollars are only utilized for "other wildlife projects" after either the three major mitigation goals have been achieved or' opportunities to achieve them have been exhausted. From our perspective this should include mitigating all of the big game winter range habitat units lost as a result of hydroelectric development and operation.

31 The FWS disagrees with the concept of trading "expensive" mitigation for less expensive projects which do not contribute to achieving the major mitigation goals established by the mitigation planning team. To use the example alluded to in the draft report (page 40), acquiring wetlands does not mitigate for lost old growth wildlife habitat, and accordingly, the two are not comparable from either a cost-effective or a biological viewpoint.

32 There are other avenues available to purchase wetlands for the sake of their preservation - *not* as mitigation - while the Power Act may provide the only authority for mitigating old growth wildlife habitats that were lost as a result of hydroelectric development and operation in the Willamette Basin.

Alternative 2, page 40

33 The FWS fully supports the mitigation goal for old growth wildlife habitat established by the mitigation team. However, we do not believe Alternative 1 adequately achieves that goal. Accordingly, we developed the FWS Alternative described on pages 2 through 3 of this letter, and we believe it would adequately mitigate old growth impacts.

Section IV. B. 2. Summary of Mitigation Scheduling, page 41

34 We believe the old growth mitigation schedule for implementation should be flexible to take advantage of reduced timber and land prices as well as willing sellers when those conditions occur: Also. we need to realize that opportunities to mitigate for old growth in-kind will continue to rapidly decline over time.

Table 3, page 42

35 The FWS would like to have this table expanded *to* include a summary of the cost estimates for the "FWS Alternative" presented earlier on pages 2 through 3 of this letter. We would be eager to assist in developing the necessary information to accomplish this task.

Section IV. B. 1, page 53

36 The discussion concerning cost-effectiveness is very misleading. In our opinion, it is not appropriate to compare the costs of a mitigation plan which would fully meet the mitigation goals to a plan which would only partially meet the same mitigation goals. It is similar to comparing the cost of an entire bridge to the cost of half a bridge - one costs more but satisfies the need for a bridge, while the other costs less, but obviously does not satisfy the need. A cost-effectiveness comparison can only be made between two actions which both satisfy the same goal. Accordingly, we do not believe the mitigation plan which fully mitigates the losses can be rejected for not being "cost-effective."

Appendix E: Mitigation Summary Table

37 Based on the fact that at this time most of the mitigation plan is-conceptual in- nature, we believe this table should be modified to show that, depending upon the location of the mitigation lands, old growth species could benefit from the acquisition and management of some of the lands identified.

SUMMARY

38 The FWS believes the draft report contains the basic information necessary to develop a detailed mitigation plan which adequately addresses the significant wildlife Josses nod resultant. mitigation goals identified by the planning team. However, we strongly believe Alternative 1 needs to be modified to insure that the old growth wildlife habitat and big game winter range mitigation goals are more fully met. We have tried to show how the above could bc accomplished conceptually and at a reasonable cost by modifying Alternative 1 as described in the FWS Alternative.

Finally. we strongly believe that the mitigation of old growth needs to be considered equally with the mitigation of winter range and riparian habitat, and that achieving the mitigation goals of all three must receive the highest priority in the development of a detailed mitigation plan.

MEYER. PW.CL.3-26-87

We have appreciated the opportunity to be a part of this planning effort and look forward to participating in the development and implementation of the final detailed plan.

Sincerely,

for Russell D. Peterson
Field Supervisor

MEYER.PW.CL.3-26-87

Response to Specific Comments: USFWS

Because the preceeding USFWS letter has been superceded by the USFWS May 1 letter (J3-1), a detailed response will not be provided. However, several points need to be addressed.

In general, based on the revised final report and interim discussions with the USFWS, many comments in this letter are no longer pertinent, including the original options of the preferred alternative (expanded from two to three) and the costs and proposals put forward in Table 1. Also, there is confusion as to the Structural Replacement Goal [see J3-3 (pg. 1, P. 3 reference)], and the "functional" old-growth concept.

The USFWS refers several times (pg. J3-6, P. 11;' pg. J3-7, P. 15; pg. J3-7, P. 18; pg. J3-9, P. 23; and pg. J3-10, P. 27) to a concept we cannot support: active management of second-growth forests for functional old-growth. Functional old-growth is an arbitrary definition specific to this mitigation plan. It essentially identifies a point where a second-growth forest 1) provides thermal cover for elk and, 2) possesses some attributes of mature forests. The concept inherently trades this level of habitat value (which will not be true old-growth for another 60 to 110 years) for the long-term protection that will allow it to eventually become true old-growth. Functional old-growth, as used in this report, is not a goal, as indicated by the USFWS. It is an arbitrary point at which credit is given, on a weighted scale (Table 5, page 52).

The statement by ODFW staff (pg. J3-7, P. 15) was taken out of context and did not refer in any way to functional old-growth, but rather to second-growth. ODFW accepts the concept that second-growth forest can be managed to increase its habitat value to certain wildlife species. This management does not make it functional old-growth. There is no evidence that the aging process of true old-growth can be accelerated (see pg. J1-11, ref. Pg. 4, P.27).

The USFWS comments several times (pg. J3-5, P. 4; pg. J3-6, P. 8; pg. J3-9, P. 21; and pg. J3-10, P. 32) on the inappropriateness of seeking out-of-kind mitigation (e.g., wetlands). As the lead agency for mitigation planning in the Willamette Basin, we have a responsibility to consider all mitigation possibilities. There is a strong possibility that purchase, for example, of sufficient old-growth or second-growth forest to meet our mitigation objectives, is not possible. We have clearly identified the replacement of winter-range, riparian habitat and old-growth forest as the priority objectives of this mitigation plan. The NPPC wildlife representative has, on several occasions, including the two formal consultation meetings held on the Willamette Basin Plan (Appendix A), identified the importance of considering all possible alternatives. We have attempted to do this.